Concrete

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Modern Practice in Concrete Street Construction

Testing of Materials and Specimens of Concrete—Careful Setting of Substantial Forms—Proportioning of Materials by Weight—Control of Water-Cement Ratio—Increasing Use of Central Mixing Plants — Machine Finishing and Thorough Curing Are Some of Outstanding Trends

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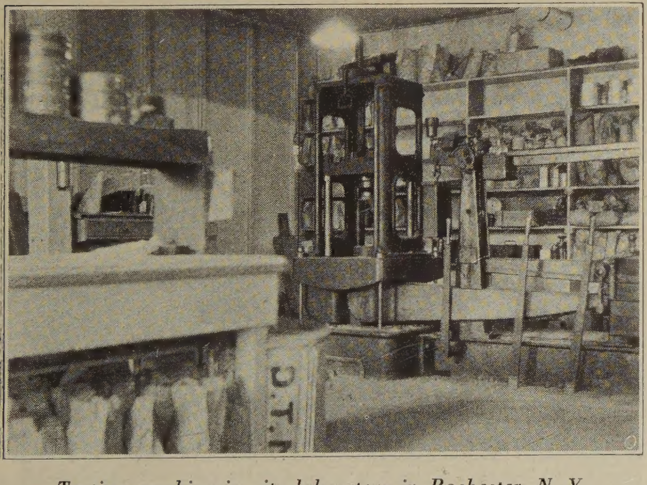
CONCRETE street construction has not been as well standardized as highway building under the stabilizing influence of the Bureau of Public Roads. Nevertheless, the first concrete street pavements in this country, more than thirty-six years old, are still giving good service.

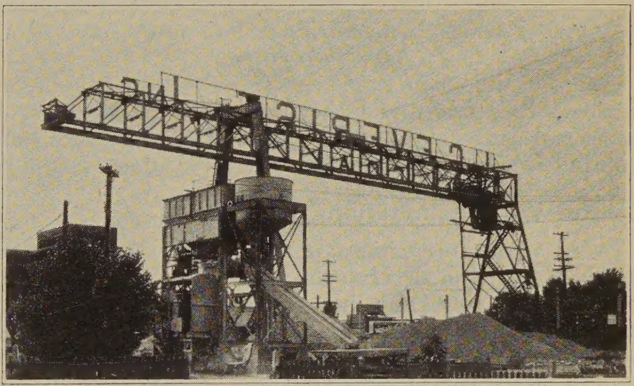


Testing machine in city laboratory in Rochester, N. Y.

Naturally, experience and research during thirty-six years have modified pavement construction of today.

Materials and Tests

It is generally recognized that only clean aggregate should be used in a concrete pavement. This usually requires that stone and sand be washed. Occasionally a harsh working mix is caused by removal of too much fine sand, and this must be replaced. Cities are today paying more attention to the soundness of aggregates. Organic matter in the sand, shale, flint or unsound particles in the coarse aggregate, must be determined in advance. The tests for soundness are simple and easily applied in the city testing laboratory. In New Hampshire the state highway department gives assistance to cities without a laboratory of their own. In Rochester, New York, the city laboratory tests and approves aggregates to be used by contractors. The laboratory then determines the exact mix to be used to give dense concrete of the class and strength desired for concrete pavement. The approximate pavement mix is specified as 1:2:3. The actual mix for the materials to be used may be 1:2.1:3.2. This has resulted in more uniform concrete of the quality desired and in greater economy to the contractor. In cities where the local aggregates are not considered satisfactory for surface wear, a two-course pavement may be built. In Erie County, in western New York, for example, a top course of concrete using gravel up to ⅝-inch is used.



All batching is by weight at this central mixing plant in Sioux City, Iowa

Proportioning Aggregates by Weight

In up-to-date street construction, aggregates are proportioned by weight, not by volume. It is just as simple as batching by volume, and allows much more accurate con-

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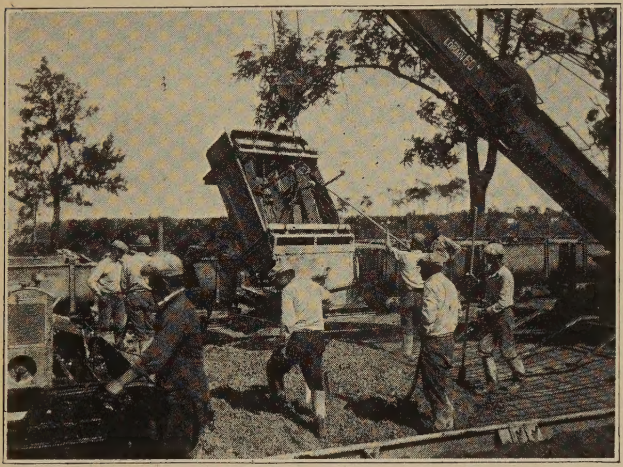
Abstracted from 1930 Official Proceedings of the American Society of Municipal Improvements.

trol. It practically eliminates the effect of bulking of sand from moisture content. An illustration shows a batching plant installed for weight measurement, at Sioux City, Iowa.

Central Mixing Plants

Central mixing plants are gaining in favor for modern construction. They eliminate the necessity for frequent change in location of storage piles and delays while a paving mixer is slowly traveling from one street to another. Palo Alto and Los Angeles, California, Portland, Oregon, Kansas City, Washington, D. C., and Rochester and Albany, New York, are some of the cities using centrally mixed concrete on paving work. Some type of agitator body is usually employed in delivering the mixed concrete. Reports from all of these cities indicate satisfaction. It is easier and cheaper to handle and control water and aggregates at the central plant and more uniformly strong concrete is delivered on the street.



Delivering centrally mixed concrete from batch boxes, in Royal Oak, Mich.

Careful Water Limitation

Every year more cities are designing their pavement and base mixes to develop the definite strengths desired, and carefully regulating the amount of water in the mix. Of course, other factors may affect the strength of the concrete, but it is unquestionable that for a workable paving mix using known aggregates, the strength varies with the amount of water. The simple apparatus for determining the moisture content of sand and stone may be installed in a back room of the engineer's office if not convenient to do this on the job. This test is made once or twice a day or more often.

The total gallons of water per sack of cement (usually 5½) is specified in accordance with the strengths desired. Water already in the aggregates is deducted to determine the amount of water added to each batch. Mixer manufacturers can now supply accurate water measuring tanks. One of the first duties of the inspector is to see that the gauge correctly indicates the amount of water discharged and that no more than the required amount can be turned into one batch. Even cities not yet specifying the water in gallons per bag of cement, maintain dry concrete by use of the slump test. Sloppy batches produce poor concrete.

Forms

Substantial forms staked solidly in place and set truly to line and grade are the first assurance of true surface and smooth riding pavements. The long heavy strike-off or the finishing machine bring a considerable strain upon the forms. Steel forms are today built with a base as wide as six inches. Rain or water from the concrete often softens the subgrade under the forms and even a slight shifting of the form will cause a wavy pavement surface.

Surface Finishing

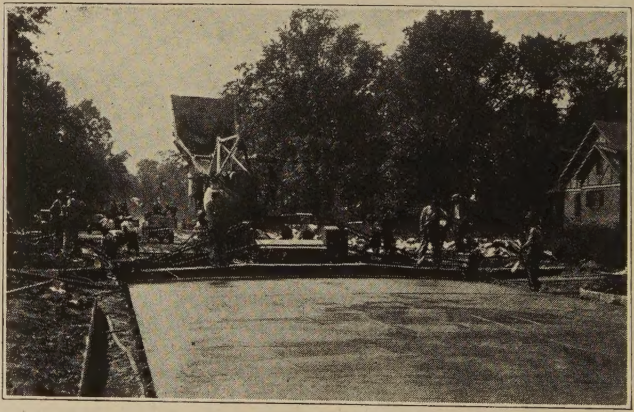
Up-to-date construction requires the least possible amount of "finishing." We all know how too much "finishing" can bring to the surface an excess of fine material and laitance that will separate readily from the slab below. Perhaps the most important effect of over-finishing is working excess water into the surface concrete, and thereby weakening it. With the relatively dry concrete used today, good practice calls for a heavy strike-off, weighing 20 to 30 pounds per foot, followed by a lighter one, each pushing a ridge of material before it, and one belting. Hand floats and "lutes" are used to correct irregularities and where the crown is too irregular to use the strike-off.

Scraping the surface with a light straight-edge is recommended to remove any excess of fine material and water, followed by a final belting. A burlap belt is sometimes used to remove this surface film. Where a particularly "non-skid" surface is desired, as on grades, a coarse broom drawn once over the surface leaves a coarse, gritty texture, yet smooth riding.

The Finishing Machine

Finishing machines are coming into greater use on street paving. The advantages are the use of a stiffer concrete, greater speed and economy and more uniformity in the slab. Sometimes the machine operates on side forms, while the curbs are cast in place later. Sometimes combined curb and gutter are placed first and the machine rides the edges of the gutter slabs or on a center form if the street is wide.

Hand finishing is used at the intersections, at least until a finishing machine is devised especially for this work, but machine finishing is suited to a considerable amount of street work, where curb grades do not vary greatly and the crown is uniform. Plane surfaces instead of curbed crowns make the use of the machine still easier. The machine is especially suited for paving wide streets where the concrete is laid in strips ten or twenty feet wide.



Finishing machine operating on steel side forms, on paving work in Indianapolis

Tests of Concrete

Speed limits are increasing on through streets, arteries and boulevards, and rough riding pavements are always objectionable. Few cities today neglect to use the 10 ft.

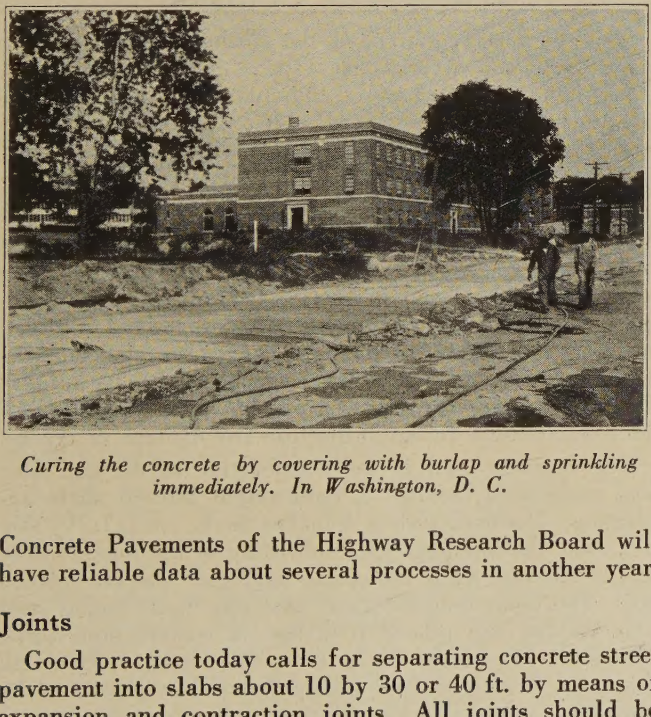
straight-edge to check surface smoothness of concrete pavement. Up-to-date construction uses a metal cap for premoulded joints or a filler for poured joints, that does not project above the surface, so that finishing may be carried straight across it.

The strength of the concrete is checked continually during construction. From the concrete deposited on the streets, the inspector casts at least two 6 by 12 in. cylinders for each block of pavement. If practicable these are cured in the ground in the same manner as the pavement, then are capped and broken damp in the city laboratory or a commercial testing laboratory, usually at seven, fourteen and twenty-eight days. The city of Los Angeles regularly records 28 day strengths of over 4,000 lbs. per sq. in. with standard pavement.

Some cities now break beams 6 by 6 by 30 in. to determine the transverse strength of the pavement. Both tests are especially valuable when pavement must be opened to traffic at the earliest possible moment. Duluth, paving Michigan Avenue, with high-early-strength concrete in 1926, secured 2,100-lb. strength at four days and 2,950 lbs. at six days. The street was opened to ordinary traffic in four days. Cores are later cut from the slab, capped and broken as a final check on the thickness and strength.

Curing

Keeping the pavement continuously moist by the application of water is still the accepted method of curing. In a few cities "ponding" or continuous spraying are employed. A more common method is covering with wet burlap over night, followed by earth or straw covering kept wet for 14 days. Even where pavement is opened in less than 14 days, additional wetting down at intervals is desirable. Curing by application of a surface coating of some material is in vogue in some cities. Tests do not agree as to the merit of these alternative curing processes, and it is hoped that the special Committee on Curing of Concrete Pavements of the Highway Research Board will have reliable data about several processes in another year.



Curing the concrete by covering with burlap and sprinkling immediately. In Washington, D. C.

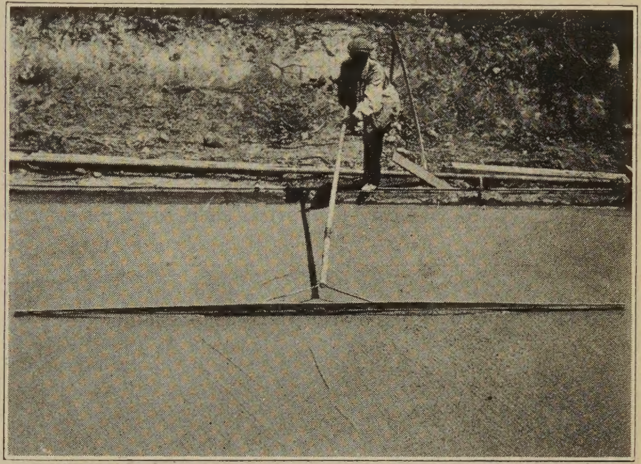
Joints

Good practice today calls for separating concrete street pavement into slabs about 10 by 30 or 40 ft. by means of expansion and contraction joints. All joints should be edged at the surface, straight, and truly vertical. Expansion joints must be entirely filled with the "filler," leaving no room for stone or other incompressible material to work in.

Four types of concrete curb are in general and satisfactory use today. Curb may be cast in place either before or after the pavement slab is laid. Curb precast in sections is used in western New York and in the South. Roll face curb formed integrally with the pavement slab is economical to build and presents an attractive appearance. Combined curb and gutter, laid before the balance of the pavement, gives the best control over poor drainage. On bad soil the gutter is dowelled to the pavement slab.

Some Examples of Good Concrete Street Construction

In the new pavement on Essex Avenue in Kirkwood, Missouri, proportioning by weight was required for the 1:2:3½ mix. Water, including all free water in the aggregates, was held at 6½ gallons per sack of cement. Central mixing and machine finishing were allowed by the specification but the Carlon Construction Company, the contractors, brought a mixer on the job as usual and finished by hand. Time of mix was held at one minute.



Scraping surface with straight-edge to remove fine material and excess water, on paving work in Kirkwood, Mo.

A slump of ¾ in. to 2 in. was called for. This rather dry concrete required considerable hand finishing and would have been well adapted for machine finish. The slab was 24 ft. wide with deformed metal center joint. The concrete was struck off and tamped three times with a strike-off weighing not less than 15 pounds per lineal foot. Final finishing was obtained with a 10-ft. longitudinal float, followed by belting. Some surface water was removed with the 10-ft. aluminum straight-edge.

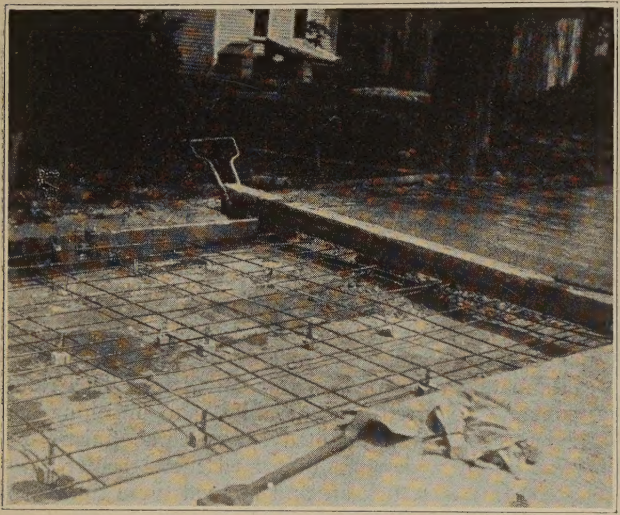
Forty-two pound wire mesh reinforcement was used. One-inch pre-moulded expansion joints were spaced 90 ft. apart with "planes of weakness" at thirty-foot intervals. Expansion material was left one-half-inch below the surface of the pavement and supported by a header shaped to the crown of the pavement so that it did not obstruct finishing. After removal of the header the half-inch of concrete was cut out and the joint edged, and later poured with asphalt. The "weakened plane" joints for contraction were formed like the "dummy joints" of the west coast states by driving a tee-iron into the surface of the concrete to form a wedge shaped groove one-half inch wide at the top and two inches deep. These joints were also edged, and poured with asphalt.

Three-eighths inch by five-foot tie bars were placed across the center joint four feet apart. Three-quarter inch by four-foot dowels on two-foot centers, with one end greased, free to move, were placed across all transverse joints. At expansion joints only a metal sleeve was placed on the greased end of the dowel to provide room for thrust.

In building the integral curb a face plate was clamped to the back form to permit tamping concrete in the curb. In a few minutes this was removed and the curb shaped and smoothed by the finisher. Features of this job were the substantial supports for the forms, the care taken to have expansion joints fully open, straight, vertical and at right angles to the forms; also the use of pins to hold dowels and tie bars in their proper place. The specifications called for burlap and wet earth curing but allowed surface application as an alternate. William Berry was the engineer.

A finishing machine was used on street jobs in Indianapolis by the Indiana Asphalt Paving Company with good results. Straight face concrete curb was first cast in place along the street. Steel forms were placed two or three feet out from the curb on which the finishing machine was operated. The narrow strip next the curb was finished later by hand and the depth of gutter adjusted for drainage. This outer strip was keyed to the main slab with a tongue and groove joint. A deformed plate was used for the center joint.

A last year's job in Old Town, Me., illustrates care in placing double bar mat reinforcement. The contractor, John Webster, of Bangor, supported each joint on a small cube of concrete which was cast into the slab. This job also illustrates an especially coarse broomed surface on a steep grade, secured by tying the tufts of fibre together.


Bar reinforcement supported on cubes of concrete, in Old Town, Me.

A feature of 1929 work in Washington, D. C., was the use of metal plates expanded with a filler to form the expansion joints. A V-shaped plate formed planes of weakness at contraction joints. Expansion joints are spaced 90 ft. apart and contraction joints marked by grooves cut three inches below the top of the pavement at intermediate thirty-foot points. All joints are later poured with bituminous filler. Another feature on the Washington work is the use of adjustable steel forms for casting the concrete curb in place along the slab.

Summary

The main points of up-to-date concrete street construction may be summarized as follows:

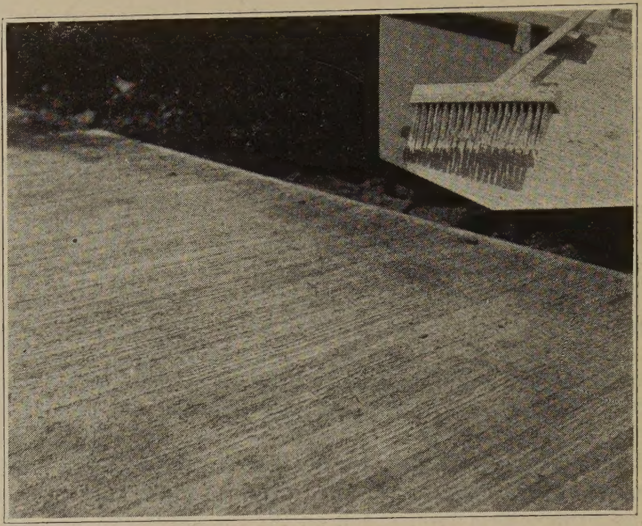
Substantial forms carefully set;

A designed mix with materials proportioned by weight;

Accurate limitation of total water to a specified number of gallons per sack of cement;

Steadily increasing use of central mixing plants and machine finishing;

The least amount of finishing required to bring the concrete to true contour and dense hard surface;


Surface on grade is made "non-skid" with a coarse broom, shown in the upper right-hand corner of the picture

Thorough curing to develop the full strength of the concrete, especially important during the first few days;

Tests to determine that the desired strength, smooth surface and thickness have actually been obtained;

The results, in the cities mentioned and many others, are street pavements of uniformly high quality and greater economy for the contractor and the city.

Freight Car Floor of Haydite Withstands Collision

Some 65 representatives of the mechanical and operating departments of railroads visited the Universal Atlas cement plant at Buffington, Indiana, on May 22nd and inspected a box car equipped with a concrete floor.

This type of car floor is considered especially well adapted to the hard usage of bulk cement shipments. The smoothness of the floor makes unloading easier, as the scrapers used in unloading bulk cement meet with no obstruction.

The car was placed in service in January, 1930. Recently, while in transit, it broke loose and coasted 500 feet, crashing into a loaded gondola car. One of its trucks was knocked out of place, the king bolt and bolts holding the center plates were sheared off, but an examination of the concrete floor failed to disclose any damage or cracks.

The concrete used in the construction of the car floor was made with haydite, a light-weight burned shale aggregate. The floor slab is 4 inches thick. A 1:2:2½ mix was used, the fine aggregate consisting of the regular sand size of haydite, while the coarse aggregate was the ¾-inch size. The main reinforcement used was ⅜-in. round steel bars welded and placed 6 inches on centers both ways. This steel was placed ¾ in. from the bottom. American Steel and Wire Company welded fabric was placed in the upper surface to take care of temperature stresses.

It is believed that the use of light-weight concrete in freight car floors has especial possibilities in the construction of refrigerator and cattle cars or any other type where the additional dead weight is more than offset by the gain in insulating value.

How Swimming Pools Are Financed

Public Sentiment Must Be Favorable—Financing Campaigns and Methods Described—Fees Charged—Municipally Owned and Semi-Commercial Pools Most Numerous—Good Commercial Investment in Some Sections

By W. H. McPHEETERS

EVERY town or city of 3,000 or more population should have a swimming pool that is kept sanitary. Young people are going swimming and if there is no sanitary pool they will hunt water of some kind. Quite often it is water unfit for this purpose. It is really a public duty to see that there is a sanitary place for young people to go swimming.

Public swimming pool at Elgin, Ill.

There are a number of methods of financing municipal swimming pools. Before discussing several of these methods I want to discuss briefly a very important preliminary procedure.

Must Create Public Sentiment

Public sentiment for the swimming pool must first be created. It may be sponsored by any of the civic organizations of the town. Generally when the subject is brought up at a luncheon meeting and discussed, there are about as many ideas of how to go about it as there are individuals present. After everything is discussed pro and con and it seems that there is a sincere desire for the pool, the next step, if the organization is to get very far is to arrange for a talk to the organization by someone who has had experience in helping secure a pool for some town. If it looks possible, then set a date for a general meeting and invite the various other civic organizations to co-operate. Through these organizations, create public sentiment for the pool. In the case of a public swimming pool the creation of public sentiment is generally not difficult.

The next step is to get down to business and discuss the various plans of financing, choosing the one best adapted to the particular locality.

Financing by Public Funds

In many of the larger cities the construction and management of the pool may be, and generally is, handled by the park board, using public funds. A park board, backed by public sentiment, may appropriate funds for this purpose.

Financing by Public Subscription

After sufficient public sentiment has been created for a public pool it is sometimes possible to finance it by public contributions. In a project of this nature some will donate labor, some materials, some professional services and others cash. Many times a small town may have a pool by this means when it would be almost impossible by any other method. It may not be possible to get quite enough funds; but usually enough can be obtained so that the balance of the money may be borrowed and paid off by charging a fee high enough to bring receipts above operating expenses.

From paper read before American Association of Hygiene and Baths, Stillwater, Okla., May 16, 1930.

Many cases have come to my attention where merchants having doubtful bills due them, made arrangements, by tactful means, whereby the man owing the bill worked this debt out and the merchant cancelled it. This did not necessarily work a hardship on the merchant, for the bills involved in the arrangement probably could never have been collected.

I have knowledge of a merchant who built a large reservoir for a pleasure resort by allowing his debtors to work out their debts. He told me that he used this method of collecting bad debts, and it worked. He considers that he has a reservoir free.

Many times it is easier to get contributions through such clubs as the Rotary, Kiwanis, Lions, Chamber of Commerce and American Legion, than to get them individually. Many successful campaigns have been conducted by combined efforts of these clubs.

Financing Through Sale of Advance Membership Fees

If it is impossible to have a municipal swimming pool financed by one of the above methods, it may be accomplished through the sale of advance memberships. Such memberships entitle the advance purchaser to all privileges of the pool for a season, or even longer. Nonmembers pay a higher charge, similar to the charge at a commercially operated pool, in order to pay operating expenses.

Fees at Municipally Owned Pools

Whether or not fees of admission to a municipal pool are to be charged depends on the wishes of the people and also upon the method of financing. If the financing method followed pays completely for the pool, then a nominal fee may be charged to pay operating expenses, as there will necessarily be some expense. There should be a person in charge to check clothes and rent bathing suits. One or two paid life savers must be employed. There are other incidental expenses such as light and water.

The charge at a municipally owned pool should be only large enough to cover expenses and contingencies so every one will have the opportunity of enjoying the water. If it is thrown wide open, with no charge at all, crowded and insanitary conditions will be the certain result.

If the pool is built on a plan of financing whereby the money is not all raised at the start, the fee must be large enough so that both the money borrowed and the operating expenses can be paid.

Fees at Commercially Operated Pools

The fees actually charged at pools operated for profit vary quite widely, depending on location and type of patrons. A large pool can be operated at a lower charge per customer than a small one. The scale of fees should be such as to attract people to the pool and at the same time give the owner a profit that conforms to the speculative character of the investment. The following scale is fairly representative of the rates usually charged at a commercially operated swimming pool:

Children's Days	
Mondays, Wednesdays and Saturdays, 10 A. M. to 12 M.	$ 0.10
Children, 16 yrs. and under, on all other days	0.15
Towel	0.05
Adults with own suit and towel	0.25
Rental for suits and towels	0.50
Children's season tickets (16 yrs. and under)	5.00
Family tickets (Parents and children under 16 yrs.)	12.00
Adult season tickets	7.00

The above season ticket rates are based on a season of about three months.

How Some Pools Were Financed

Let us now consider facts about the financing of swimming pools that are actually in operation. A better vision may be obtained from something that has actually happened than from statements of average or typical cases.

At Norwalk, Ohio

The financing of a swimming pool at Norwalk, Ohio, was sponsored by a local organization which had been previously formed to supervise municipal recreation work, and was called the Playground Association.

A general meeting was called, at which time eight team captains were appointed and workers were assigned to each team to solicit subscriptions. Meetings were held daily and subscriptions tabulated. A large placard showing a boy in a bathing suit, with a thermometer at his side, and headed "Make Him Swim," was placed on the court lawn. It registered the pledges each day. Campaign headquarters were at the Kiwanis Club, but all civic organizations co-operated. The sum of $6,000 was raised in cash and pledges in one week. A local bank followed up pledges for collection. A card index was used to check up work of solicitors. With the labor and materials donated, the funds were sufficient to construct the pool. No charge is made for the use of the pool. Two playground supervisors are in charge. They are paid out of funds raised by public subscription.

At Pana, Illinois

When the question of financing the building of a community swimming pool was considered, the decision was made to secure the required funds through the sale of bonds in $50 denominations to the people of the community, rather than to raise the money by public subscription, according to an article in "The American City," by L. S. Johnson. The bonds were made deemable in five years and will pay 6 per cent interest during that period. This plan was first tried out and found successful in the same city in connection with the construction of a large auditorium for the Pana Chatauqua association about ten years before.

The Chatauqua association issued the swimming pool bonds, and the sales campaign was conducted by the Pana Association of Commerce. Teams were appointed to solicit subscriptions for the bonds, and the entire issue was sold in a three-day drive, some individuals investing as much as $500 each. The mortgage was held at a bank and was protected not only by the annual income from the Chatauqua sessions, but by the income from the swimming pool. The Chatauqua association let the contract for the building of the pool, and that organization assumed the responsibility for the conduct of the enterprise. The Association of Commerce handles all clerical work incident to the project.

In Ellsworth, Kansas

In Ellsworth, Kansas, a reinforced concrete swimming pool 50 by 100 ft. in plan was built by a group of local business men as a semi-commercial venture. The depth of the water is enclosed with a 4-ft. wire fence. An admission charge of 25 cents is made for adults and 10 cents for children. Suits rent for 10 and 25 cents. The first season's largest receipts for a single day amounted to $65.00 and the net earnings averaged several hundred dollars a month. Ellsworth is a community of about 3,000 population. The pool, though a comparatively small project, is a paying investment.

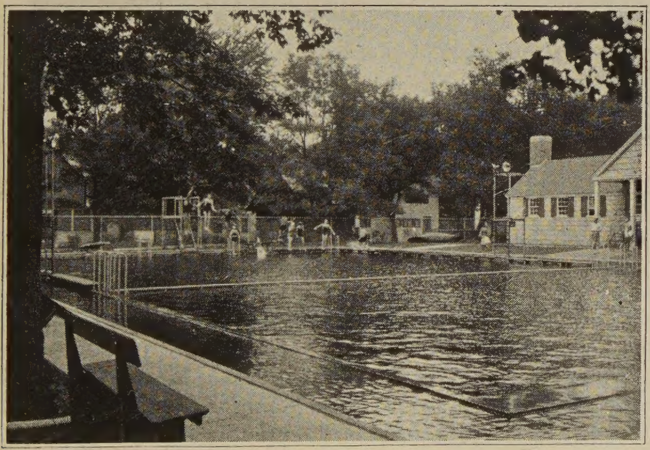
In Glendive, Montana

Glendive, Mont., with a population between 4,000 and 5,000, built a circular swimming pool 150 ft. in diameter and 1 to 8 ft. in depth. The pool was located in a city park and constructed by the park board. An admission charge of 10 cents per person is made. At the end of the first season, after all operating expenses were paid, there was a net profit of 27 per cent of the total cost of the pool.

Municipal swimming pool at Park Ridge, Ill.

Convert Abandoned Reservoir Into Swimming Pool

Altoona, Pa., built a swimming pool 120 ft. square by utilizing an abandoned reservoir, thereby converting useless city property into a popular recreational park. Children are charged 10 cents for the use of the pool and the dressing room, and adults are charged 20 cents. An imperfect financial record of the first year's operations indicated that an average of about 300 people went into the pool each day, and that the revenue obtained even from the nominal charges made would soon pay the cost of the entire pool back into the city treasury. The cost of this pool, however, was lower than under average circumstances because of the existence of the reservoir.



A municipal swimming pool in ideal surroundings

Recommends Swimming Pools as Good Investments

Henry S. Curtis, director of physical training and hygiene for the state of Missouri, cites an example in Maryville, Mo., located in the northwestern part of the state and having a population of about 7,000. Several years ago the city built a swimming pool at a cost of $16,065. During the first year 35 per cent was earned on the investment. Mr. Curtis says that no city of 5,000 or greater in population should be without a swimming pool, unless the city is fortunate enough to be located in a section where natural bathing places are available. He suggests that it is more satisfactory to have the pool built and operated by the city itself, but that it is a sound and profitable commercial enterprise when privately owned and operated.

Thirty-Third Annual A. S. T. M. Meeting in Atlantic City

Many Reports and Papers Dealing with Cement and Concrete—Revision of Standard Cement Specification Recommended—Method for Measuring Materials in Fresh Concrete

Cement and concrete were to supply the subject-matter for two full sessions of the Thirty-Third Annual Meeting of the American Society for Testing Materials, in session in Atlantic City, N. J., from June 23rd to 27th. One thousand persons were expected to attend.

Among the most important of the committee reports scheduled for this meeting was that of Committee C-1 on Cement. The report includes the tentative specification for high-early-strength portland cement and it recommends for immediate adoption certain revisions of the standard specifications for portland cement. These latter include raising the required 7-day mortar tensile strength from 225 to 275 lbs. per sq. in., and the 28-day requirement from 325 to 350 lbs.

Committee C-4 on Clay and Cement-Concrete Pipe was to present new specifications for reinforced concrete culvert pipe and specifications for reinforced concrete pipe, for publication as a tentative standard.

Committee C-6 on Drain Tile was to present abstracts of studies of the durability of specimens of different concretes in alkali soils and water.

Committee C-9 on Concrete Aggregates was expected to submit a report on Bertin's method of measuring materials in fresh concrete mixtures and four methods of testing fresh concrete mixtures. Other subjects covered in the same report include a bibliography on mixing concrete, and investigation of elasticity and volume changes of concrete, conditions affecting the durability of concrete.

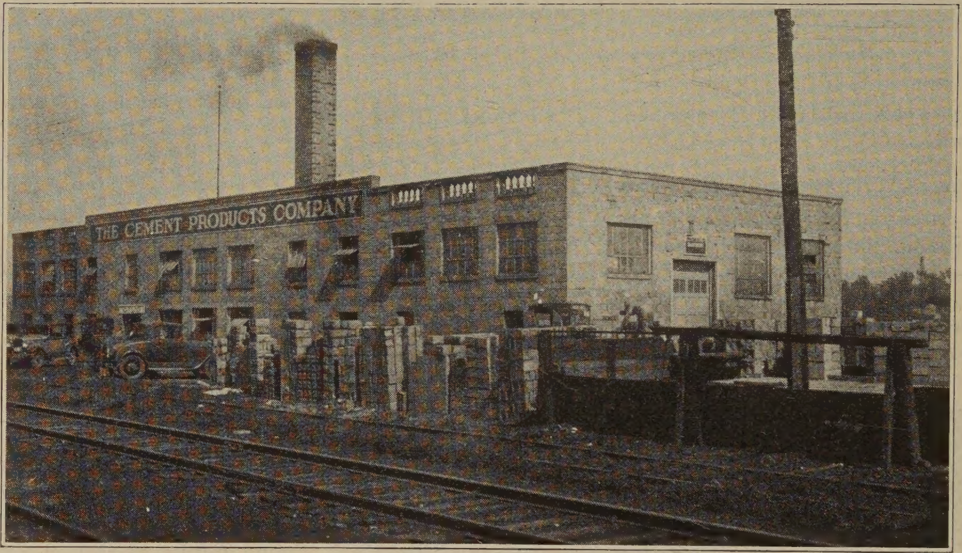
Committee C-2 was to present its report on reinforced concrete, and a sectional committee on Specifications for Plastering was to report the formation of sub-committees to develop specifications for cement plastering.

Many papers of the greatest importance to the concrete construction and cement manufacturing industries were to be presented. These included a paper on "The Rate of Hydration of Cement Clinker," by F. O. Anderegg and D. S. Hubbell. Other papers were on "A Study of Fourteen Brands of Standard Portland Cements and Four Early Strength Cements," by C. H. Scholer and L. H. Koenitzer; a paper on "The Relation Between the Strengths of Cements Developed by Mortar Specimens and by Concrete Specimens," by P. H. Bates and J. R. Dwyer, and "Strength and Resistance to Sulphate Waters of Concrete Cured in Water Vapor at Temperatures Between 100 and 345 Degrees Fahrenheit," by Dalton G. Miller. "Studies on the Workability of Concrete," by W. F. Purrington and H. C. Loring; "Tests of Plain and Reinforced Haydite Concrete," by F. E. Richart and V. P. Jensen; "Variations Within the Water-Cement Ratio Law," by Ira L. Collier; "Flow of Concrete Under Continued Compressive Stress," by Raymond E. Davis; and "Volume Changes of Concrete," by C. H. Scholer and E. R. Dawley.

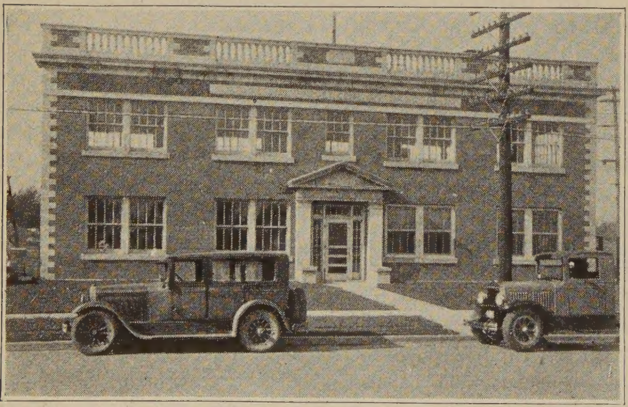
Well-Designed, Attractive Products Plant Is Credit to the Industry

Cement Products Company, of Davenport, Operates in High-Class Industrial Building—First Favorable Impression from Business Office—Orderly Arrangement of Production Equipment—Cast Stone Work an Important Department—A Second Attractive Plant in Same City

IT is not usual to find a concrete products plant established in a building that is particularly impressive. Too often the contrary is the case. This is true to the extent that the concrete products industry has become associated in the minds of many people with structures of the shed type, covered with corrugated iron, tar paper or any other material that might serve temporarily as a means of keeping out the wind and rain.



An unusually attractive and substantial building houses the offices and the manufacturing equipment of The Cement Products Co., Davenport, Iowa. Walls are of concrete units, trimmed with cast stone. Clausen and Kruse, of Davenport, were the architects



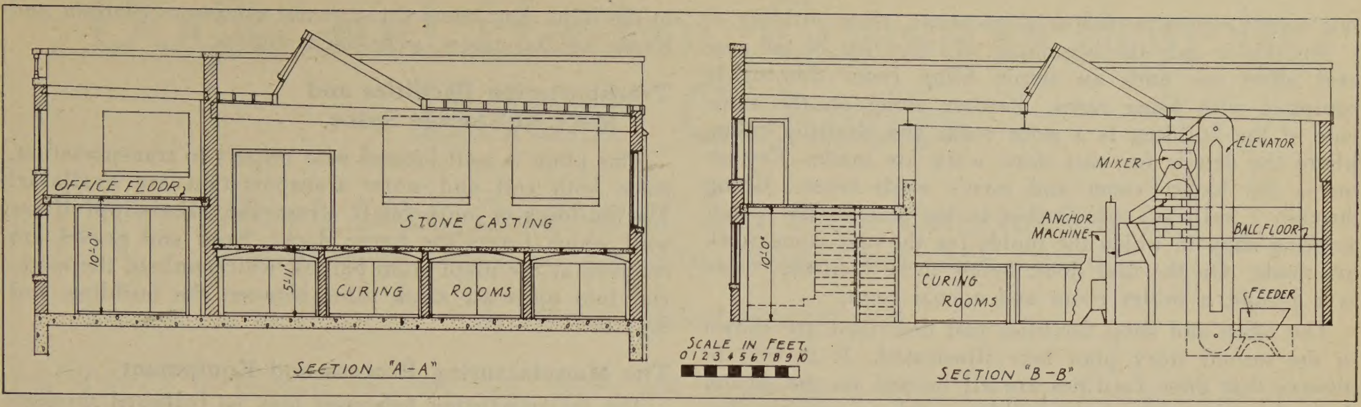
This building, erected and occupied by the Northwest Davenport Cement Block Co., Davenport, Iowa, has a front wall of concrete brick, trimmed with cast stone, and side and rear walls of hollow concrete units, all made by this company

Unusually Attractive Products Plants

It remains for Davenport, Iowa, to supply two concrete products plants, either of which might be considered as the goal toward which all concrete products manufacturers should aim, when planning the future development of their plants. While it may be undesirable from the standpoint of original investment for a new plant to start off with as pretentious a building as these, a plant should nevertheless be laid out so that every addition may be a step toward the ultimate goal. One of the two plants mentioned is the 2-story building occupied by the Northwest Davenport Cement Block Company, which originally devoted most of its time to the manufacture of cast stone, but now manufactures haydite building units as its principal product. The other plant, and the one which will be described here in detail, is the 2-story building of The Cement Products Company, at 715 East River Street, in Davenport. We are permitted to describe this plant in detail through the courtesy of Austin Crabbs, the president and manager.

Cast Stone Business Brings Visitors

The Cement Products Company has a large volume of business in its cast stone work. This means that among the visitors to the plant are people of influence, such as architects, members of boards of education, or members of church or lodge building committees, most of whom do not often visit concrete products plants. In these visits

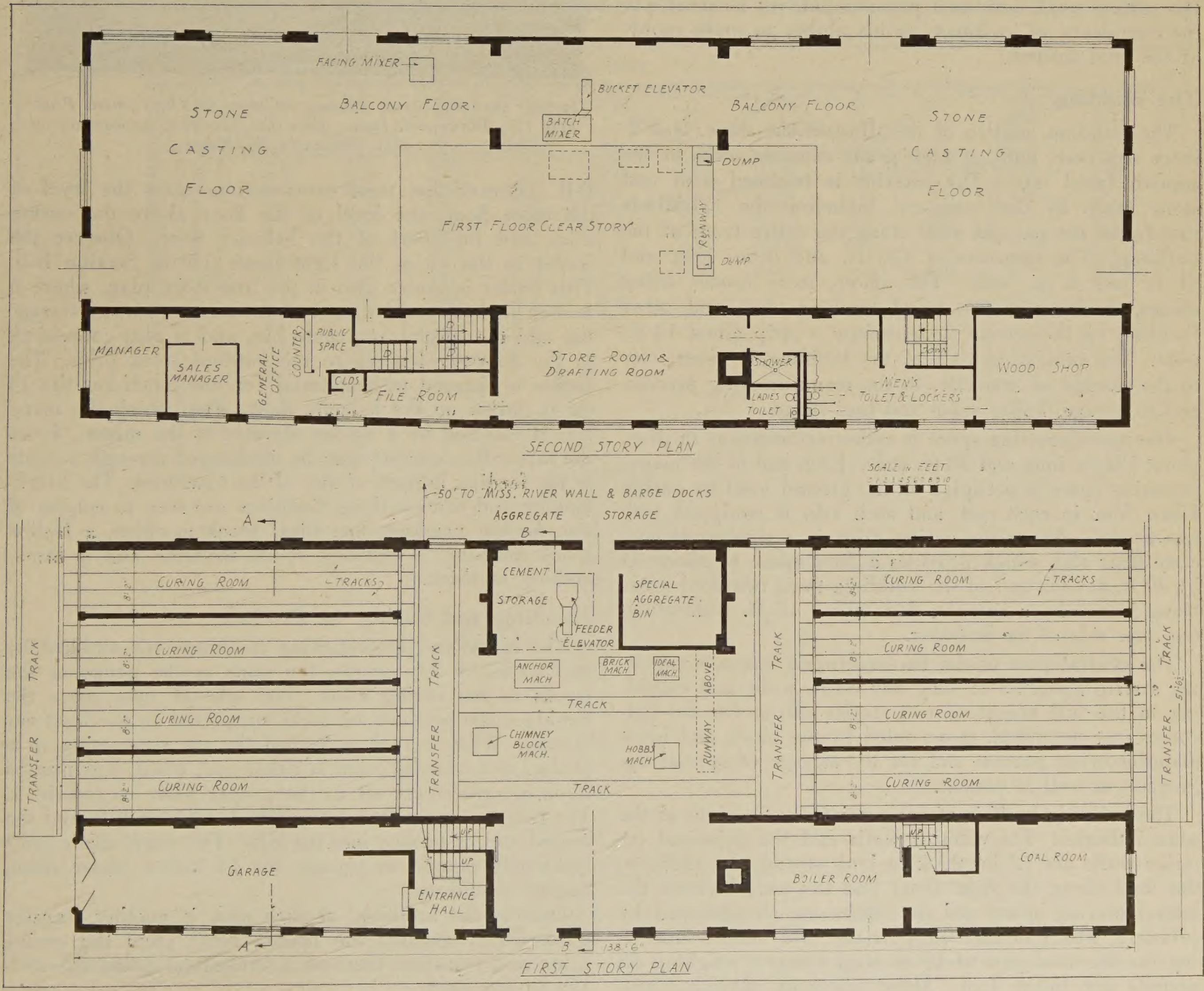


Transverse sections through plant of The Cement Products Company at Davenport, Iowa

they are often investigating the merits of the material made at this plant as compared with natural stone, or with cast stone made elsewhere.

A Well-Equipped Business Office

Considering these circumstances, one can readily see the importance of making the proper sort of impression on these occasional but important visitors. Perhaps the first thing that impresses a visitor to the office of The Cement Products Company is the fact that here is a real business office, not merely the corner of the plant partitioned off. It is located on the second floor of the building. The principal office space is divided into a front office and two private offices, the front office being occupied by a girl who attends to the switchboard, to typewriting and stenographic work, and to other general office work. Farther on is the office of the sales manager, while at the far end, in the corner of the building, is the office of Austin Crabbs, the president and manager of the company. The office fixtures and appointments are exactly as



First and second floor plans of the plant one would expect to find in a downtown office building.

But this is only the beginning. To the rear of the general office one finds an ample filing room thoroughly equipped with filing cases. Farther along on the same side of the building is a store room and drafting room, where the details for cast stone work are made. Farther on is the locker room and men's wash room. Going through a hallway, still farther to the rear, is the woodworking shop in which the molds for the cast stone work are made. On the first floor, below these facilities, there is a garage, a boiler room and a coal room.

The office and shop facilities just described are shown in the second story plan here illustrated. It is well to observe that these facilities are all located on the second floor along one side of the building, and are entirely shut off, except by doorways, from the manufacturing part of the building.

The Selling Organization

The fact that this company has a sales manager does not necessarily mean that it enjoys the services of a large group of salesmen. There are three men in the organization that do a considerable amount of selling work. Besides the sales manager and Mr. Crabbs, the man who details the cast stone work and who designs and makes the molds for such work also spends considerable time in calling on architects. Frequently he makes direct sales. His selling work is in part promotional, for he must win the confidence of architects in his ability to make molds of the kind desired.

The Building

The building, as two of the illustrations show, is a 2-story structure, built of high grade concrete units of the smooth faced type. The exterior is trimmed with cast stone made by the company, including the balustrade that forms the parapet wall along the entire front of the building. The structure is 138 ft. and 6 in. long and 51 ft. and 6 in. wide. The offices, store rooms, filing rooms, drafting rooms, wood working shop and other facilities on the second floor occupy a strip about 14 ft. wide. The remaining part of the building is given over to the storage of material, to the manufacturing process, and to garage, boiler room and fuel space.

The manufacturing space is rather symmetrical in plan, about 138 ft. long and 38 ft. wide. Each end of the manufacturing space is occupied on the ground level by curing kilns, four in each end, and each kiln is equipped with two tracks. Above the curing kilns is a reinforced concrete floor slab which provides a floor space of about 34 by 40 ft. at each end of the building, these two floor areas being joined by a balcony floor about 13 ft. wide along the river side of the building.

The central part of the manufacturing space, comprising a strip about 55 ft. long and 34 ft. wide, and extending to the full height of two stories except for the balconies just described, is occupied by the block and brick manufacturing process and for the storage of special aggregates as well as cement.

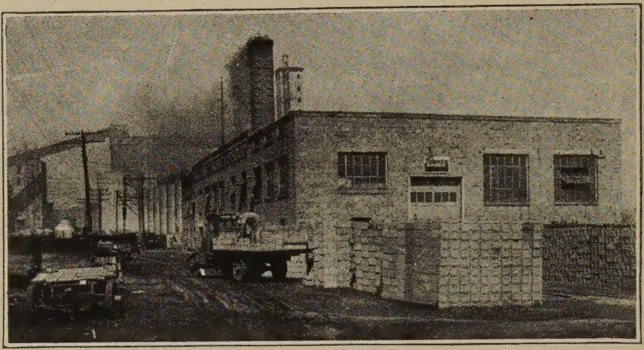
The building itself is of substantial construction, as the plan indicates. The exterior walls and the principal interior walls are 12 in. thick in both stories. In addition, the wall along the river front and the wall between the manufacturing space and the offices are strengthened by pilasters, which in turn support the roof beams, consisting for the most part of 18-in. steel I-beams weighing 55 pounds per linear foot. Three saw-tooth skylights provide ample light for the manufacturing space, in addition to the light that enters through the windows. Clausen and Kruse, of Davenport, were the architects.

Transportation Facilities and Material Storage Space

This plant is well located with respect to transportation, since both rail and water transportation are available. The building is only 50 ft. from the Mississippi River wall which forms the barge dock. Sand and gravel are received at the plant from barges, which unload the material into open air stock piles between the building and the river.

The Manufacturing Process and Equipment

The manufacturing processes may be followed through the plant in their logical order. Reference should be made to the cross-sections of the building, shown in one of the illustrations and designated as Sections A-A and B-B. Observe that these cross-sections show the level of the office floor, the level of the floor above the curing kilns and the level of the balcony floor. Observe the feeder in the pit at the right hand side of Section B-B. This feeder is shown also in the first story plan, where it is seen to be located directly between the cement storage bin and the special aggregate bin, and is also convenient to the doorway leading to the outdoor stock piles. The feeder is charged with material for one batch for the 14 cu. ft. mixer on the balcony floor, after which the material is elevated by a bucket elevator to the mixer. From the mixer the concrete may be discharged through a chute to the feeding hopper of any of the machines. The block-making and brick-making machines are seen to consist of one Anchor machine, one Ideal block machine, a Hobbs block machine, a chimney block machine and a brick-making machine.



Storage yard and truck driveway at plant of The Cement Products Co., Davenport, Iowa. Note the excellent appearance of this company's building

Handling and Curing the Product

The block and brick-making machines are serviced by two tracks of 2-ft. gauge, the same as the gauge of the tracks in the curing kilns. The take-off men place the freshly made products on racks supported on the light car frames. When a rack is loaded the car supporting it is pushed to a transfer track at either end, where it is pushed upon a transfer car set in the proper place to receive it. The transfer car is then pushed in front of a kiln and the loaded rack is pushed into the kiln. The newly made units ordinarily remain in storage for 24 hours, under steam curing conditions.

Outside the building, at each end, is another transfer track which receives the loaded racks from the curing kilns and transfers them to a convenient point for storage in the yard.

(Continued on Page 28)

Dock and Harbor Construction in British Colonies

Wharf, Jetty, Quay Wall, and Bank Construction in China—Details of Design—How Piles Are Driven

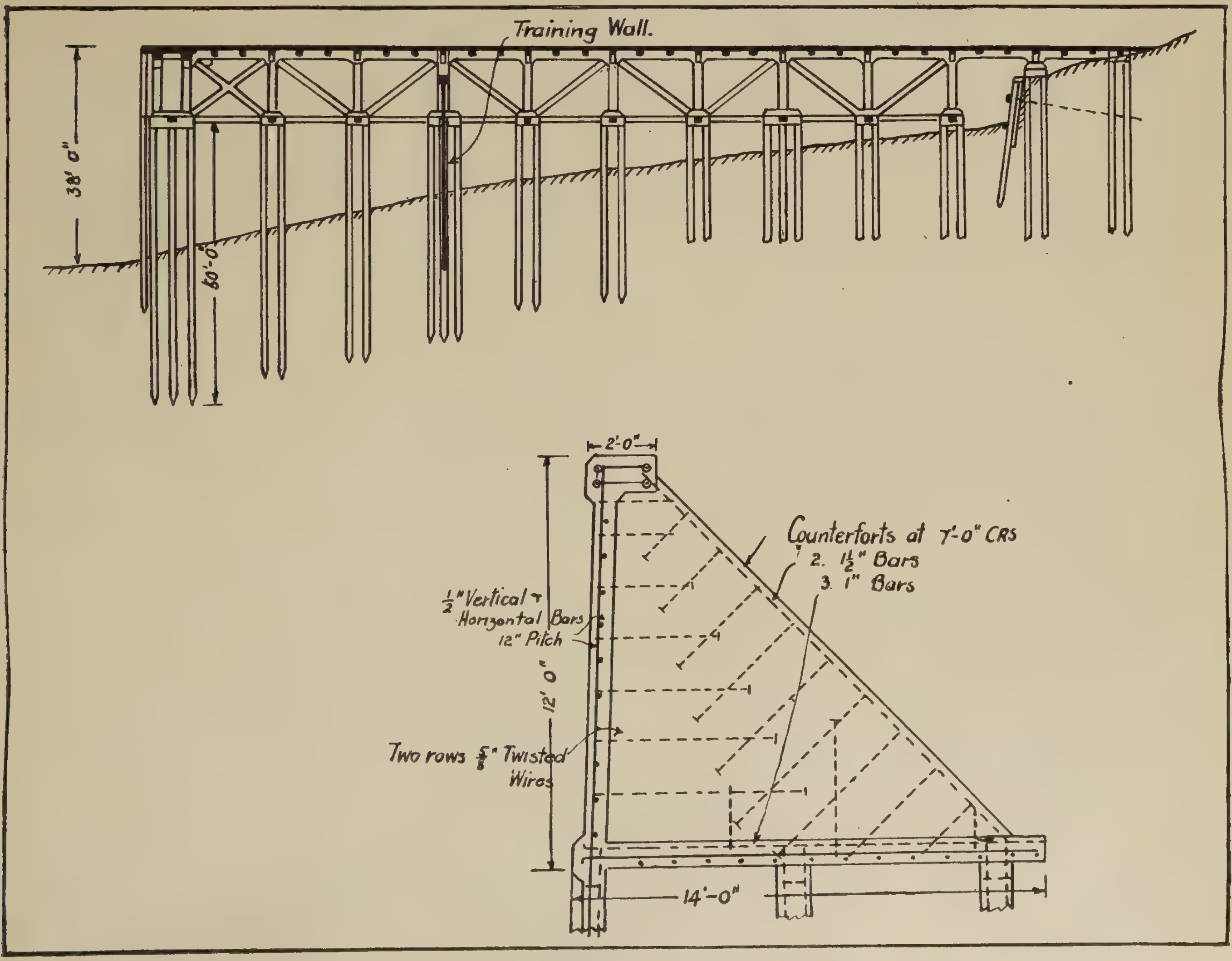
By **MAJOR JOHNSTONE-TAYLOR**

A SURVEY of recently completed dock, harbor and coast defense works which form part of an extensive British Colonial development in Asiatic waters reveals several interesting applications of reinforced concrete. These notes are principally concerned with the use of reinforced concrete as an alternative to timber for jetty and bank protection work. On the Whang Poo River, Shanghai, there are comprehensive works consisting of a reinforced concrete skeleton wharf supported on piles of the same material and a reinforced concrete quay wall of the buttressed class forming part of the same works. The nature of the ground is peculiar, being composed of about 25 ft. of stiff sandy clay overlying silt of considerable depth. The general arrangement of the wharf which is designed for a depth of 22½ ft. of water at low tide is shown in Figure 1. It is 174 ft. wide and 1160 ft. long.

Design

Some details of the design are given in Figure 2, from which it will be seen that the piers are 15 in. square and are spaced 15 ft. apart in each direction. Each pile in turn is supported on a group of 14 in. square piles. Beams run across the wharf from side to side over each row of piers and they support a system of cross beams which are spaced 5 ft. center to center while there is a reinforced concrete deck 5 in. thick. Rails at the front of the wharf which carry a 5-ton crane are supported on heavy longitudinal beams which run from end to end.

The bases of the piers which are the pile caps are con-


Training Wall.
38' 0"
60'-0"
2'-0"
Counterforts at 7'-0" CRS
2. 1½" Bars
3. 1" Bars
½" Vertical + Horizontal Bars 12" Pitch
12' 0"
Two rows ⅝" Twisted Wires
14'-0"

Figures 1 and 3

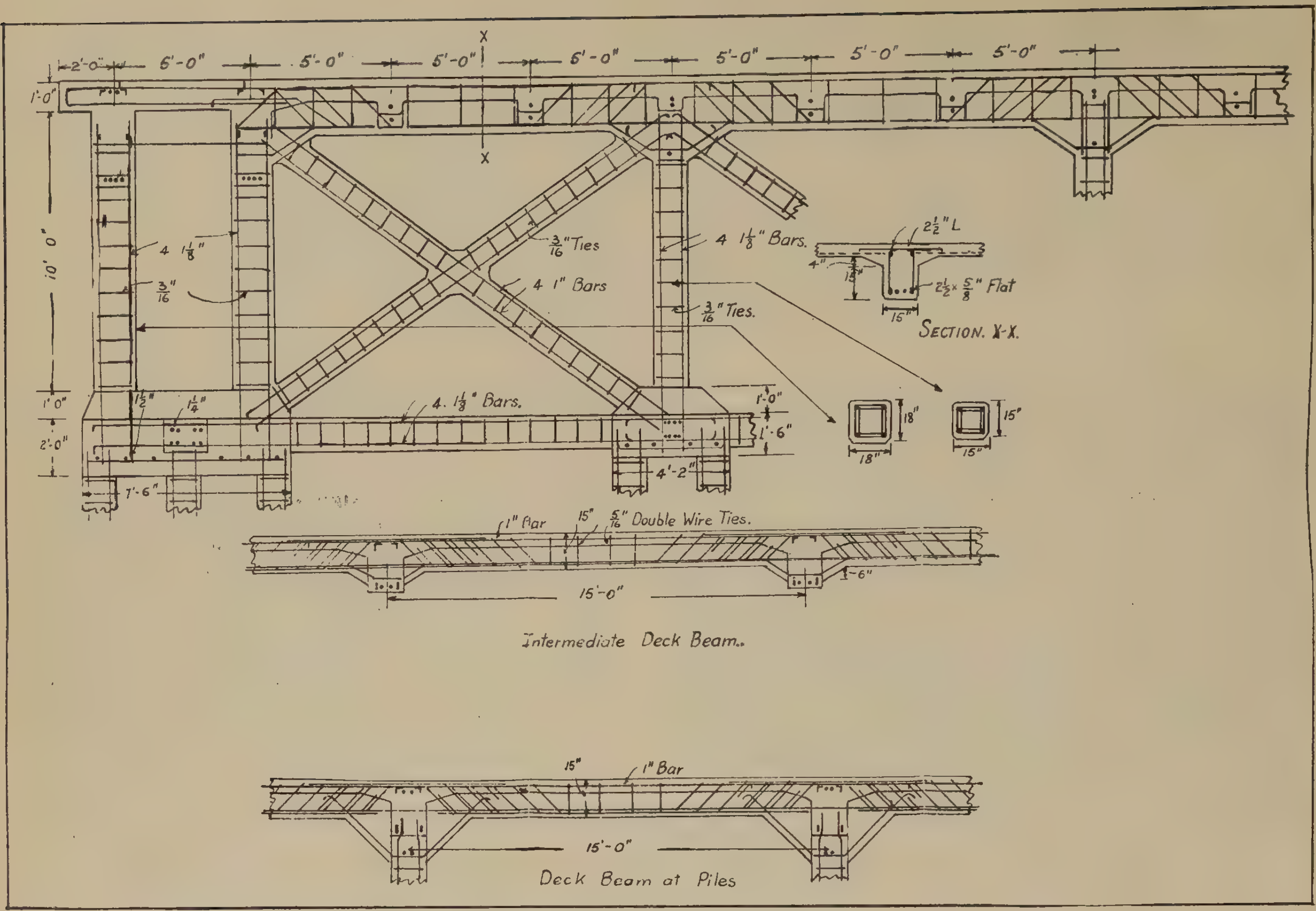


Figure 2

nected both ways by horizontal members, while further stiffening is effected by a system of diagonal bracing from front to back at each row of piers and also in the case of the last two bays at each end, longitudinally. In line with the front of the shed, of steel construction and set back 52 ft. from the face of the wharf, is a sheet pile training wall as shown. These sheet piles are also of reinforced concrete and above high water are continued in the form of a curtain of reinforced concrete slabs. Their purpose is to act as a retaining wall for the silt. The decking is designed for a load of 500 lbs. super foot, the maximum load on each pile being some 11 tons, but the supporting power of the mud is relatively high when all water between it and the pile has escaped and conditions of true skin friction are in evidence.

Construction

The piles shown in Fig. 2 were moulded in a horizontal position. Driving was effected without the use of a steel helmet. A thin piece of pine was placed directly on the pile head, above which was a ¾ in. steel plate surmounted by 4 in. of hardwood. An ordinary short timber dolly was provided to take the actual blow of the hammer. In order to maintain perpendicularity and dead square driving, arrangements were made for the pile to run in guides between rubber covered rollers packed with thin pine battens which, traveling downward with it, precluded any lateral movement. The arrangement worked well in giving protection to the pile heads. All the members with the exception of the pile caps, beams and deck were moulded on shore. For the purpose of erection a timber platform was firmly clamped onto the heads of each group of piles at the level of the base of the caps, but permitting the heads of the piles to project through. From these the concrete was then cut away so as to leave the metal bare. The horizontal bracing running parallel to the length of the wharf was then laid in position, the ends of these longitudinals resting on the timber platforms. The longitudinals then served to support the temporary staging from which the remainder of the work was erected. The steel rods projecting from the ends of the various members either overlapped or were hooked round each other within the area of the pile caps which were then concreted in position so as to form a rigid connection between pile, bracing and columns.

Quay Wall Construction

One is apt to associate quay wall work with heavy block construction involving either concrete or masonry blocks supported if necessary on a piled foundation. Part of the work at Shanghai involves some 500 ft. of quay wall of the counterforted type as shown in Figure 3.

The wall is founded on cross rows of 12 in. square piles, the front row thereof serving as king piles to a continuous line of sheet piles, the latter forming the face of the wall up to a height of 12 ft. below quay level. The heads of the piles are connected by a deck 14 ft. wide above which the wall consists of an approximately vertical slab tied back to the deck by the counterforts. Resistance to overtuning is provided for by a filling of rammed dry earth on the deck in addition to such anchoring hold as is provided by the back piles, the designer having assumed in his calculations that the cross sectional area of the earth and concrete within the limits of the piles and counterforts may be regarded as one solid mass whose combined weights act together in one vertical plane.

~ EDITORIAL ~

Why This Contractor Gets Business

A CONTRACTOR in Los Angeles has built 200 concrete tennis courts in two years, and is still going strong. Curiously enough, he has obtained many of his contracts at prices ranging from 15 to 25 per cent in excess of the low bids.

There is no secret about this unusual, but entirely logical, situation. This contractor has a local reputation as a specialist in the construction of tennis courts of high-grade concrete. He made his reputation on his first tennis court contract two years ago. Since then he has guarded his reputation more carefully than anything else he possesses.

Two hundred tennis courts in two years is a rather impressive volume of business. With drainage and with grading and seeding of shoulders it represents more than $600,000 in contracts.

In these days of high-pressure competition for the general run of construction contracts, the wise contractor is the one who builds up a reputation as the best man for certain special kinds of work.

Contracts for Concrete Work on Farms

MANY a farmer of some local influence has turned definitely against concrete because of the failure of some minor piece of concrete work which he himself built. We have in mind a county commissioner who is vigorously opposed to concrete roads for just that reason.

This raises the question as to whether local builders can get contracts for such work on farms.

Some builders say it can not be done. They explain that when a farmer plans the construction of a major building he awards the contract to the local carpenter or the local mason. It is too much for him to undertake. But when he contemplates building a concrete foundation wall or a feeding floor, he likes to do the work himself. He rather enjoys playing around with concrete, and he can do such work in spring while the soil is too wet for cultivation.

Doubtless there is much truth in that assertion, so far as the small farmer is concerned, but we doubt that it is true when applied to the more successful farmer who operates on a larger scale and on a more business-like basis. Concrete work with him means floors and foundations for dairy barns, concrete tanks and silos, storage cellars for apples and potatoes, small dams for private water supplies, bulk-heads to prevent soil erosion, concrete walks and drives.

Each well-conducted farm has its individual problems and possibilities for concrete work. Some local builders have found ways and means of developing this field in the more prosperous agricultural sections, but a vast amount of possible work remains untouched, work that may eventually include the major buildings themselves.

Selling Methods and the Products Industry

THE concrete products business is becoming more and more a problem of selling. This fact is in large part responsible for that more or less definite trend in the industry, commented upon in our May issue, in which a few of the well-managed concerns are seen to be pulling ahead of the rest.

It is estimated that the concrete products industry now employs about 500 men who devote all their time to selling. With 5,000 plants in existence, this means that most of them are continuing to do their selling over the telephone.

By way of contrast, representatives of "Concrete" recently visited a plant in Detroit where eight well-trained salesmen were employed under the direction of an experienced sales manager. In a Davenport plant selling occupies the full time of two men and part of the time of another. A number of plants in Wisconsin have turned definitely to modern sales methods as the principal means of getting business; and, in addition, there is the well-known group selling organization in Milwaukee.

A manufacturer may find it hard to survive unless he develops modern selling methods. That is the direction in which the industry is headed.

The Architect's Chance to Advise the Owner

A PROSPECTIVE owner of a large building of the investment type will often be guided by the architect's advice in reaching his decision either to build now or to hold off awhile.

The head of a well-known construction company now comes forward with facts which architects should lose no time in passing on to their clients.

This is the time to build, he says, because materials can now be bought at bottom prices and the most capable skilled labor may be selected from the present surplus.

By way of illustrating his point, he mentions a recent contract for a warehouse in Philadelphia which his company built in 1922. The contract price is 15 cents per square foot less than the price in 1922. His company's bid for a large loft building in New York City, offered in May, was their lowest price for a similar building in that city since 1921.

In general, the volume of new building construction has been on the decline since June, 1928. The time is overdue for an upward swing.

Current Activities of Organized Groups

Many knotty problems pertaining to cement and concrete are either in course of solution or recently completed by organized societies or smaller groups. The busy reader may keep himself informed by watching these items.

Tests of Concrete Joist and Tile Beams

A 40-PAGE report entitled "Test of Composite Beams and Slabs of Hollow Tile and Concrete" is published in the June (1930) issue of the Bureau of Standards Journal of Research, beginning on page 815.

The purpose of the tests, which were conducted by D. E. Parsons and A. H. Stang, was to determine the value of clay tiles in assisting concrete in its resistance to bending and shear. Sixty beams were tested, of which 12 were of reinforced concrete and 48 were composite beams (or joists) of reinforced concrete and clay tile.

The tests indicate that one row of tile is equivalent in shear resistance to a concrete rib having the same depth and having a width ranging from 1.6 to 2.4 inches.

Copies of the Journal in which this report is published may be obtained from the Government Printing Office, Washington, D. C., at 40 cents each.

Boston Fire Waste Survey and Nashua Conflagration

THE FIRE waste survey of Boston made by the Field Engineering Department of the National Fire Protection Association and the Albert Russel Erskine Bureau of Harvard University during last winter, under the direction of a committee of citizens appointed by the mayor, was recently published by the Boston Society of Civil Engineers. A reprint of the report may be obtained by addressing the National Fire Protection Association, 60 Batterymarch Street, Boston, Massachusetts.

The same organization has issued a 20-page pamphlet entitled "The Nashua Conflagration," describing the fire which occurred on May 4th, 1930. Copies may be obtained at 20c each.

Safety Code for Construction Work

The American Standards Association, 29 West 39th Street, New York, has undertaken the development of a safety code applicable to the construction, demolition and repair of buildings, including excavation, foundation work and erection, with particular reference to accident hazards to employees and to the public.

The National Safety Council and the American Institute of Architects are the sponsors, but nine other organizations and two governmental departments are participating.

Will Resume Concrete Contractor Meetings

THE Portland Cement Association will resume its series of concrete contractor meetings about July 15th. These meetings will continue the work covered during the past year, with the view of further developing the idea of business-getting by the concrete builder himself. Markets such as miscellaneous concrete work around industrial plants, concrete construction in dwellings, parks and playgrounds and in farm and business buildings, will be emphasized.

The first series of meetings will continue to about October 15th. Beginning about December 1st, a new series of meetings will be started in which the main emphasis will be on the fundamentals of good concrete construction practice for the contractor. The methods to be followed in the making of good concrete will be described in detail.

Ample time will be allowed for discussion by contractors attending the sessions.

Four Booklets on Concrete Masonry Building Units

THE Portland Cement Association has just issued a new booklet under the title of "Concrete Masonry—Haydite Building Units." This is the fourth of a series of similar booklets on concrete masonry units, all of which were published in behalf of manufacturers of units of the kind described. Space is left on the front and back covers for imprinting names or advertisements of manufacturers. The exact titles of the booklets, including the latest one, are

Concrete Masonry—Cinder Building Units
Concrete Masonry—Concrete Block Building Units
Concrete Masonry—Stone-Tile Building Units
Concrete Masonry—Haydite Building Units

These booklets contain non-technical descriptions of the manufacture and use of the units named, as well as descriptions of their physical and fire-resistive properties. All booklets of the series are well illustrated.

Manufacturers can get supplies of the booklets from the Portland Cement Association. Others should address the nearest manufacturer of the units in question. The manufacturer's name and address, if not known, can be obtained from the Portland Cement Association.

1930 Edition of Uniform Building Code

THE 1930 edition of the proposed uniform building code prepared by a committee of the Pacific Coast Building Officials Conference is now off the press and is available for distribution. This is the third edition of this publication, the first and second editions having appeared in 1926 and 1927, respectively.

This proposed uniform code is said to have been adopted by 77 cities, 57 of which are located in California. Seven of the cities are located east of the Rocky Mountains and thirteen are either in the Rocky Mountains or in Pacific Coast states other than California.

Copies of the code may be obtained by addressing the Pacific Coast Building Officials Conference, 19 Pine Avenue, Long Beach, California.

Ready-Mixed Concrete Plant for Small City

Simplicity of Arrangement and Operation Are Features of the Gingrich Plant in Ann Arbor—No Necessity for Storage of Aggregate—Operated Normally by One Man —Capital Investment is Moderate

A READY-MIXED concrete plant intended to supply a limited market in a small city must of necessity be designed and operated in the most simple manner. The capital investment must be held to the minimum and the operating costs must be kept within bounds.

A Plant Simply Designed and Operated

The requirements just described are well represented in the small plant built by W. A. Gingrich, in the early part of 1929 in South State Street, Ann Arbor, Mich. This plant has no aggregate storage bins and no elevating equipment, for no aggregates are stored at the plant. Sand and gravel are brought, in proper proportions, from a commercial pit three miles away, as a part of the work involved in delivering a load of ready-mixed concrete. The only material stored at the plant is the cement, which is bought in paper bags and stored in the small cement warehouse between the mixer and the railway siding. The "office" consists of a high table and some shelves in the cement storage building, near the door.

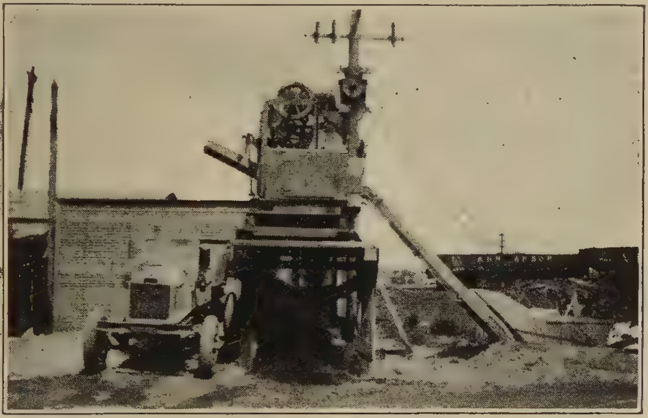


Figure 1. Side view of mixing plant, with small cement warehouse at left rear

One Man and One Delivery Truck

The "personnel," regularly employed, aside from Mr. Gingrich, consists of one man, who drives the flat-bottom 2-yard dump truck that comprises the only delivery equipment. This man, E. DeWolf, brings the mixed sand and gravel from the pit, dumps it into the skip of the mixer, brings the cement from the warehouse, charges the mixer and sets it into operation if Mr. Gingrich is not there to do it, then drives the truck around to the other side of the mixer to receive the mixed batch. After dumping the newly-mixed concrete into the truck he makes out the delivery slip, delivers the concrete, gets the slip signed and heads for the commercial pit to repeat the cycle. Upon returning to the plant with his next load of sand and gravel, he files the receipted delivery slip and sets about the work of mixing the next batch.

While this one man sometimes takes care of the normal demand, it is necessary to hire additional trucks and drivers to supply concrete for the occasional large project, especially when concrete is supplied on state highway work. In this manner the occasional heavy demands can be supplied without overloading the investment in equipment.

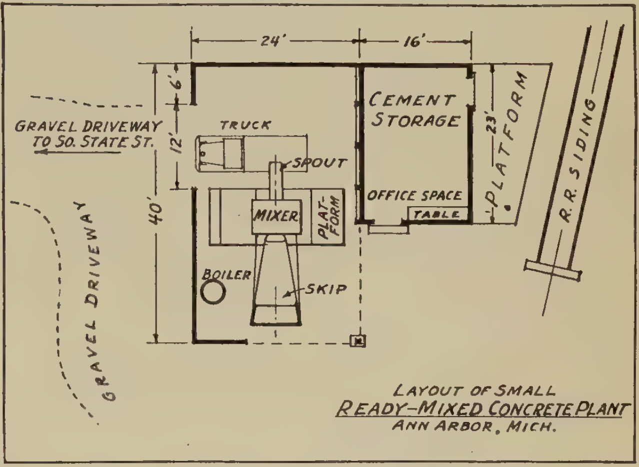


Figure 2. The plant layout

The Mixing Plant

The process of making a batch of concrete can be understood most clearly by studying the mixing plant from the illustrations. Figure 1 shows a side view of the plant, taken before it was inclosed in a wooden building. Only

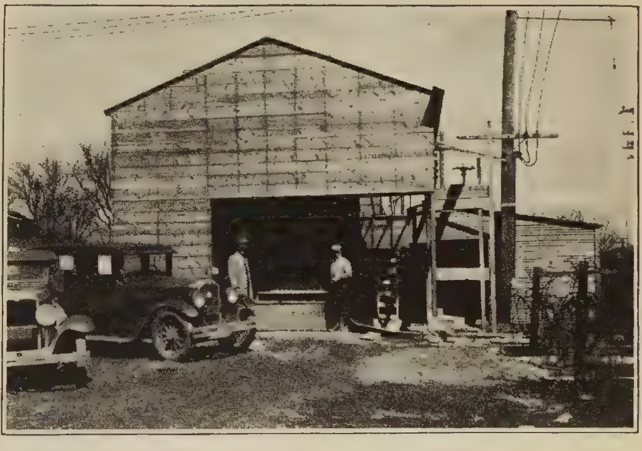


Figure 3. The plant is now inclosed in a building, erected early in 1930

the small cement storage warehouse shown at the left rear, had been built when this picture was taken.

The mixer may be seen, mounted on a platform about 7 feet above the ground, supported by a heavy timber framework. To the right is the skip into which the truck has delivered the pre-mixed sand and gravel, after which the empty truck was driven around to the left to receive the mixed batch. This is the position in which the truck is shown in Figure 1. When the mixing is completed the spout extending upward to the left of the mixer will be let down to deliver the batch to the truck.

Fitting a 2-Yard Truck to a 1-Yard Mixer

Some ingenuity was displayed in solving the problem arising from the fact that the mixer, a Knickerbocker No. 28-S, has a capacity of about one cubic yard, while the truck holds 2 cubic yards. Accordingly, the truck body was provided with a special partition gate that divides the body space into two equal parts. When the truck brings a 2-yard load of sand and gravel from the pit, one yard is dumped into the skip. The skip is raised and this first yard is delivered into the mixer, after which the skip is lowered to the ground and the second yard of aggregate is dumped into it. The truck is then driven around to the other side of the mixer (the position shown in Figure 1), to receive the mixed concrete. The first yard is then mixed and delivered to the truck, the skip meanwhile remaining on the ground, still holding the second yard of aggregate. The skip is then raised and the mixer is charged a second time, whereupon the second batch is mixed and delivered to the truck, which now contains two cubic yards of concrete.

The plant arrangement is further illustrated in Figure 2, showing the layout.

Mixing Proportions and Water Control

The mixing proportions, as a rule, are 1:2:4, but customers are supplied with any proportions desired. A water-control device regulates the quantity of mixing water and maintains uniformity from batch to batch. The mixer is driven by electric power.

Heating Materials

During cold weather the mixing water is heated in a boiler shown in the layout in Figure 2. This boiler also supplies live steam to the mixer.

Location and Length of Haul

The mixing plant is located on one acre of ground in the south edge of the city. A paved road (South State Street) passes the property on one side, and the Ann Arbor Railway provides a short spur siding on the other. Little advantage would be gained in having a downtown location, for the distance to the sand and gravel pit would be increased. With the present location, practically all points in the city where concrete construction is likely to occur can be reached by a haul of 2 miles. Hauls as long as 7 or 8 miles have been made in supplying concrete on state highway construction.

Some of the Customers

Besides several customers on state highway work, among them the Ann Arbor Construction Co., Mr. Gingrich sells ready-mixed concrete to several departments of the city government, to the Michigamme Oil Co. and to several industrial plants. Little has thus far been sold to small builders.

Mr. Gingrich devotes most of his time to calling on customers and prospective customers, and in maintaining the mixing plant in good operating condition. He advertises in local newspapers and is gradually building up confidence in the quality of the concrete delivered from his plant.

Prices and Delivery Charges

The price for the regular 1:2:4 mixture is $6.50 per cubic yard, delivered to any of the built-up sections of the city. Most points can be reached with a haul of 2 miles or less. For longer hauls an extra delivery charge is made.

Capital Investment

The capital invested, not including the cost of the land, is about $4,500. This includes the cost of the mixing plant, the delivery truck, and the building shown in Figure 3. This main building, or shed, was built in the early months of this year, while the small cement storage building was built at the time the mixing plant was erected early in 1929.

A visit to this little plant and a study of the simplicity of its operation will convince one that it represents the logical arrangement for a ready-mixed concrete plant in a small city, although in any other city of similar size due allowance must be made for special local conditions.

Well-Designed, Attractive Concrete Products Plant Is Credit to the Industry

(Continued from Page 22)

The simplicity of this equipment is quite impressive when one considers the large volume of material that is handled. Not a great amount of power is required for its operation, but it seems to do the work.

The Cast Stone Department

On the stone casting floor at each end of the manufacturing space, directly above the curing kilns, some of the most interesting part of the work is accomplished. The molds for cast stone are made in the woodworking shop on the second floor. The mixtures for the cast stone work are supplied by a separate concrete mixer shown on the balcony floor as a "facing mixer." After the units are cast they are allowed to set for a little while, and are then carefully pointed and allowed to cure.

Provision Against Cold Water

In a high-class building of this character little thought need be given to manufacturing operations during cold weather. The boiler plant has ample capacity for heating the entire building, so that the manufacture of the regular units as well as the cast stone work may continue through the entire winter, if necessary.

Delivery of Material

For the most part, the manufactured product is delivered by truck from the plant. In many cases contractors who have their own truck equipment prefer to haul their own supply, thereby saving the delivery charges.

Plans Well Worth Careful Study

After all, the plans, cross-sections and halftone illustrations contain more specific information than a brief description can give. These plans are well worth careful study, for only in that way can the full details of the manufacturing operations be visualized.

The Yield of Certain Concrete Mixes

An Economic Study of Spokane Sand and Moscow Crushed Basalt as Aggregates for Concrete Construction Illustrating Methods of Studying Aggregates in Other Localities

By A. G. DARWIN
Instructor of Civil Engineering, University of Idaho

FOR given proportions of cement, sand, and coarse aggregate, many factors affect the amounts of material which will combine to produce one cubic yard of concrete. Since cement is usually the most costly ingredient of a concrete mix, it is desirable to so proportion the aggregate constitutents that for a given required strength, range of workability, and other factors, the minimum cement factor obtains. Under the present typical arbitrary volume proportions for the state of Idaho, it is the practice to specify a minimum cement factor, as follows:

	Bbls. Cement per cu. yd.
Class "A" concrete, 1:2:4 mix	1.5
Class "B" concrete, 1:2½:5 mix	1.2
Class "C" concrete, 1:3:6 mix	1.05

The selection of proper field proportions to meet the above specification is a fruitful source of dispute between contractor and engineer and is a step which could be most safely based on conclusive laboratory tests of yield and relative economy of manufacture, together with field adjustments for economy of placing. The present study, undertaken as an illustration of required laboratory work, is intended to cover only four of the possible aggregate volume combinations and five water-cement ratios. It is restricted to crushed rock concrete of "stiff plastic" consistency made from the best materials available for crushed rock concrete construction at Moscow, Idaho. In this investigation, grading, maximum size, voids in fine and in coarse aggregate, and range of consistency have been held constant.

Results and conclusions from the study are not, in their present form, applicable to conditions or ranges other than those specified herein. However, the following tendencies may be noted:

(a). With increase in the dry-rodded proportion of sand to rock and for a given water-cement ratio, the yield of crushed rock concrete decreases at a nearly uniform rate.

(b). For all proportions and water-cement ratios investigated, there is a nearly uniform inverse relation between yield and cost.

(c). For a fixed dry-rodded proportion of sand to rock, the yield increases as the water-cement ratio increases, the yield increases as the strength decreases, and strength generally decreases as the water-cement ratio increases.

Historical

In a study of the effect of gradation on yield of concrete proportioned either by fixed volume or by the water-cement ratio theory, F. H. Jackson has reported the following conclusions for restricted tests of crushed rock concrete in New Jersey:[1]

"That variation in coarse aggregate grading will greatly affect the yield of concrete and therefore its cost when the concrete is proportioned either in the usual way (by fixed volume) or by the water-cement ratio method.

"That the use of well-graded coarse aggregate will increase the yield when proportioned by the usual method, but exactly the reverse is the case when the concrete is proportioned by the water-cement ratio method."

Harold F. Allen reached the following conclusion for a study of yield of crushed rock concrete in Kansas within the range of his particular tests:[2]

"When the fine aggregate is kept constant, the cement content of the concrete varies directly as the voids in the coarse aggregate."

J. E. Buchanan et al concluded from a short study of Moscow, Idaho, crushed rock that:[3]

"Better economy from the standpoint of yield and strength results from using the coarsest gradings possible and consistent with other limitations."

In the New Jersey tests thirteen different coarse aggregate gradings were used; the Kansas experiments were made on six different coarse aggregate gradings; and the previous Idaho tests were based on 1:5 and 1:4 dry-rodded mixes with two maximum sizes and a variation in water-cement ratios. The present investigation is limited to one straight line coarse aggregate grading, a single maximum size, a medium-coarse sand grading; with further limitations and scope as previously stated. It appears, then, that separate conditions exist for the New Jersey, Kansas, and Idaho investigations on the yield of crushed rock concrete.

Tables based on Stanton Walker's formula[4] are available for estimating the yield of gravel concrete for known materials and given conditions of weight or volume proportions of cement to aggregates either separated or combined; the weight of job aggregate for volume proportions only; the specific gravity, and hence the voids, of fine and coarse aggregate; the approximate water-cement ratio. These tables give results which closely check laboratory determinations. Yield tables prepared for crushed stone concrete in Kansas are based on given arbitrary dry-rodded volume proportions and a variation in coarse aggregate grading; the voids are not constant, nor are the data said to be generally applicable because the coarser stones are unevenly graded. Tables by Taylor and Thompson are based on low unit weights of aggregate and do not contain a factor for variations in water content. Tables by Talbot and Richart require a mortar-voids test to determine the volume of mortar.

Object of Study

This investigation was made to determine the relative economy of some crushed rock concrete mixes of "stiff plastic" consistency, using aggregates and prices typical

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[1] *Public Roads*, Vol. 8, No. 12, February, 1928.

[2] CONCRETE, Vol. 31, No. 5, November, 1927.

[3] MS Report, Civil Eng. Dept., Univ. of Idaho, February, 1928.

[4] *National Sand & Gravel Association Bulletin* 1, November, 1927.

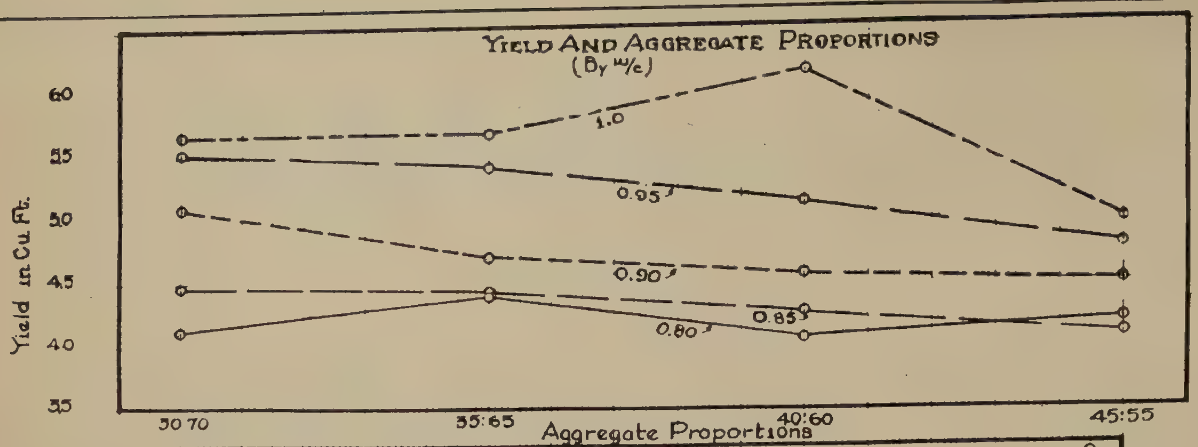

Fig 1(a)

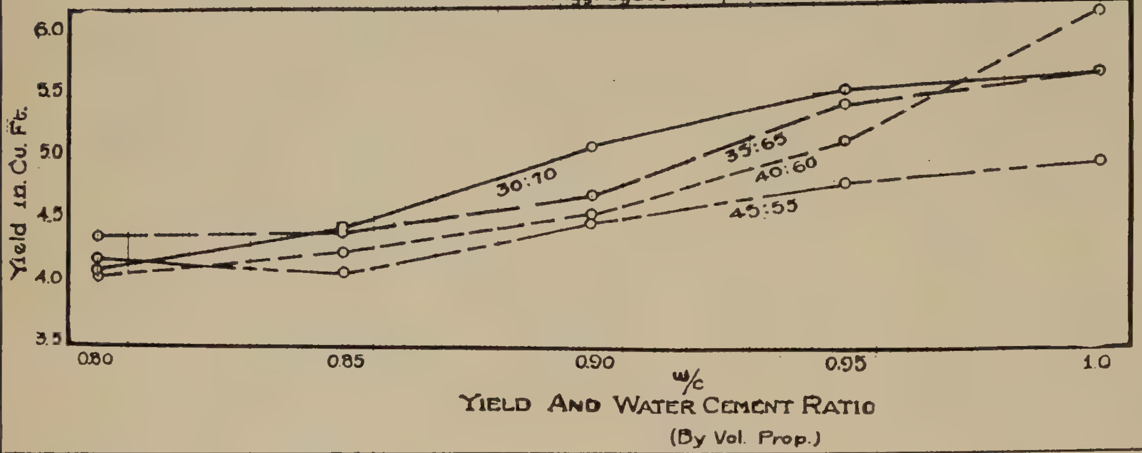

Fig 1(b)

of Moscow, Idaho. The tests were governed by an ordinary dry-rodded volume proportion of aggregates, a common range of water-cement ratios, and a consistency suited to direct placing of concrete in large forms and without the aid of chutes. By holding a constant grading and maximum size, and with a fixed proportion of sand to

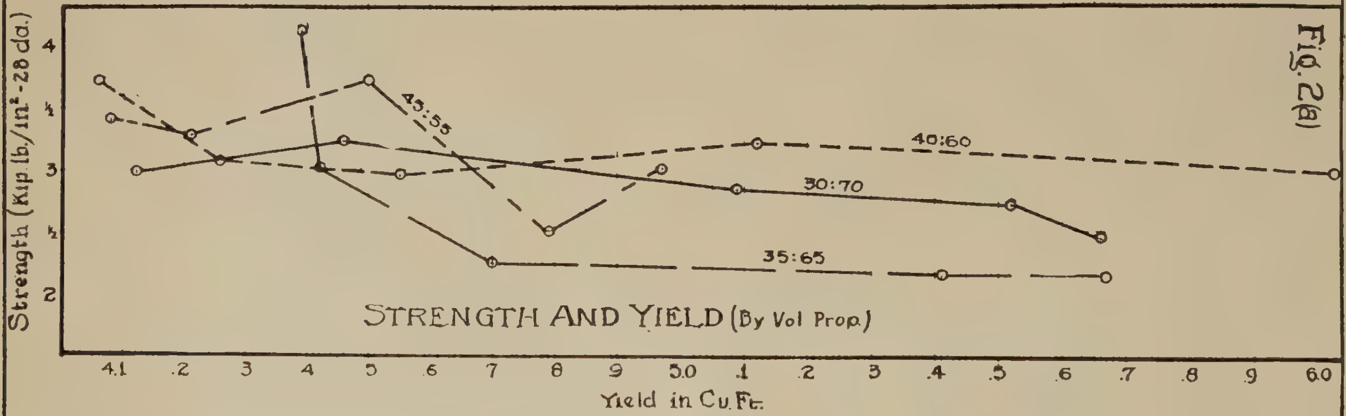

Fig. 2(a)

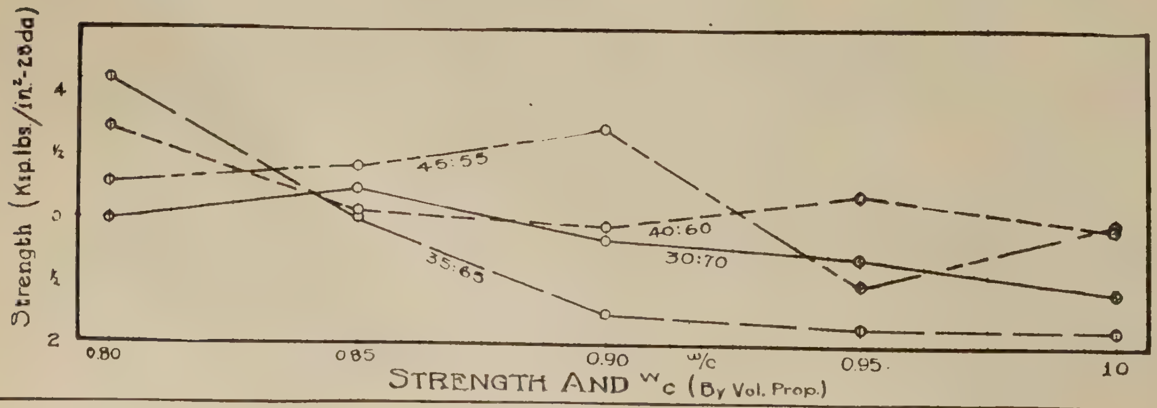

Fig. 2(b)

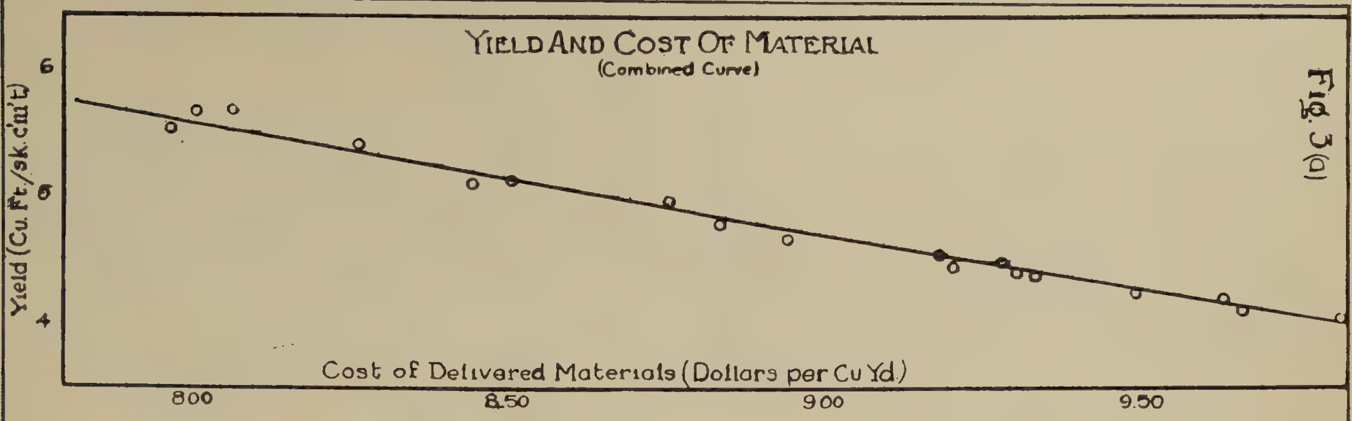

Fig. 3(a)

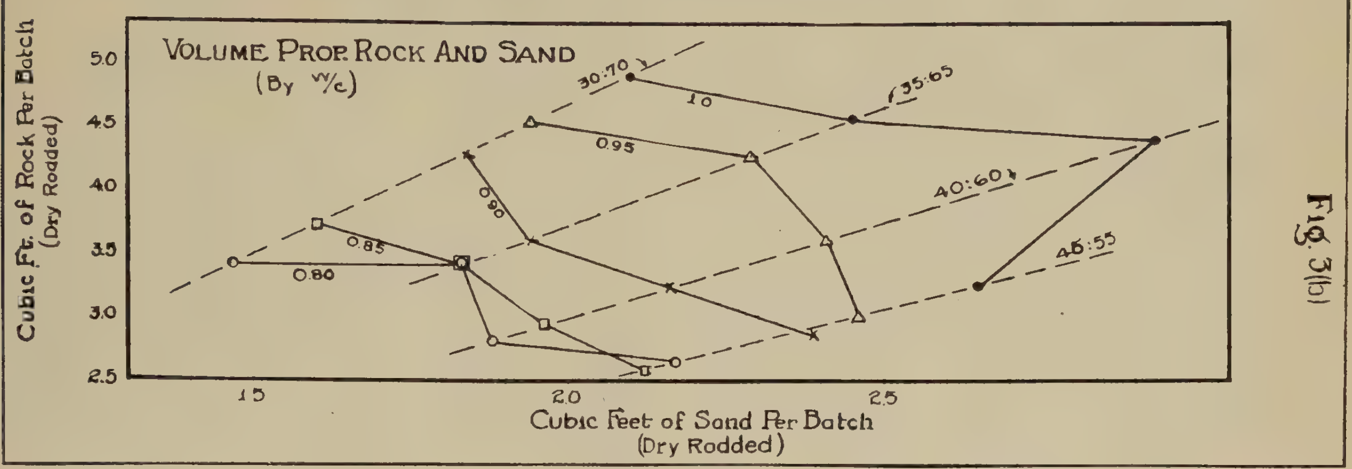

Fig. 3(b)

rock for each of four series with five water-cement ratios per series, twenty mixes were investigated. Yield was measured directly on every batch and was also checked by computation; the manufacturing cost was computed only on the basis of aggregate values, delivered. No estimate was attempted for labor charges, supplies, and equipment involved in mixing, transporting, placing, and curing the concrete.

Materials Used

The coarse aggregate was a tough, angular, clean, crushed Columbia River basalt taken from a quarry on the outskirts of Moscow and at the principal source of all local rock. This aggregate was screened, stored in separate bins, and re-combined to give the following straight line grading on square mesh laboratory sieves:

Sieve Opening	Per Cent Retained
1½ inch	0
1 inch	37
¾ inch	57
⅜ inch	86
No. 4	100
F. M.	7.80

Other coarse aggregate characteristics were:

Unit weight, dry and rodded	96.4 lbs.
Apparent specific gravity	2.86
Maximum Size	1 inch
Per cent of voids, dry-rodded	42
Absorption	0.5%
Moisture in aggregate	None

The fine aggregate was obtained from a pit near Spokane, Washington. It is composed of strong, sound, well-rounded, glacial fragments; it is in favor for building and paving construction at Moscow since local sand is a disintegrated granite with high mica and organic contents, is deficient in fines and otherwise unsuited for use as a concrete aggregate. Characteristics of the Spokane sand follow:

Unit weight dry and rodded	105.8 lbs.
Specific gravity (LeChatelier)	2.70
F. M.	3.12—3.19
Voids, dry-rodded, per cent	37
Absorption, per cent	0.5—1.0
Washing loss, per cent	3
Organic test, A. P. No 1	O. K.
7-day strength ratio with 1:3 Ottawa, per cent	120
28-day strength ratio with 1:3 Ottawa, per cent	120

The cement was a standard brand commonly used in the Moscow region. Its characteristics were:

7-day tensile strength	280 lbs. per sq. in.
28-day tensile strength	340 lbs. per sq. in.
Fineness, per cent	13
Normal consistency, per cent	24

Initial set—4 hrs.; final set—7 hrs.

All quality tests of aggregates were based on A.S.T.M. requirements as was also the mixing, molding, storing, and breaking of cylinders.

Theory

Yield is here interpreted as the quantity of fresh concrete in place secured from one 94-lb. sack of cement. A determination of yield is possible on the premise that the resulting volume of concrete equals the sum of the absolute volumes of its constituents, with no allowance for entrapped air or for honeycombs, and given a plastic and workable mix.

Aggregates may be proportioned by weight on the basis of dry-rodded volumes, some cement added by weight and the materials mixed dry; water added in a definite ratio to cement, and the resulting mix checked for consistency with the flow-table. It is then possible to add trial batches of cement and water, in the proper ratio, until the fresh concrete lies within a desired narrow range of consistency; workability can best be judged by handling this mix.

The direct measure of concrete volume follows a method employed by Harold F. Allen in tests for the Kansas State Highway department. After the concrete has been thoroughly mixed in a metal trough, a one-half cubic foot capacity metal container can be filled in three equal lifts and the concrete rodded twenty-five times for each lift. For every mix the weight of resulting concrete can be determined and the batch volume then calculated from the proportion:

$$\frac{\text{Volume of batch mixed}}{\text{Weight of this batch}} = \frac{\text{Internal volume of filled measuring can}}{\text{Weight of contained concrete}} \qquad (1)$$

With a known quantity of cement employed in any given batch, the volume obtained from the use of one cubic foot (94-lbs.) of cement may then be computed.

Any check computations of yield can be based on Stanton Walker's formula:

$$C = V_p + D_f + D_c \qquad (2)$$

where C = volume of fresh concrete, V_p = volume of cement paste, D_f = absolute or solid volume of fine aggregate, and D_c = absolute or solid volume of coarse aggregate. The solid volume of cement in one 94-lb. sack averages 0.48 cu. ft. and this, when incorporated with water in the water-ratio, X, gives a value for the cement paste of:

$$V_p = (0.48 + X) \qquad (3)$$

Given specific gravities in the Moscow tests of 2.70 for sand and 2.66 for rock, equation (2) may be reduced to:

$$C = 0.48 + X + \frac{(W_f + W_c)}{167} \qquad (4)$$

Laboratory Routine

Tests were made on the following four series of dry-rodded volume aggregate combinations: 30:70; 35:65; 40:60; and 45:55 per cent sand to rock. These series cover the range from under-sanded to over-sanded mixes. On each series batches were made up with water-cement ratios of: 0.80; 0.85; 0.90; 0.95; and 1.0 to include the ordinary strengths and still lie within the range of relatively dense and impervious concrete. Consistencies were controlled by flow-table to within about plus or minus ten points of an average of 144 per cent; slump measurements were also taken. The aggregate volume proportions were measured by weight, dry and rodded. After thorough hand mixing, each batch was subjected to flow, slump, and yield measurements and three 6 by 12 test cylinders were molded. All cylinders were stored in damp sand and tested wet at 28 days in a four-screw, calibrated, Universal testing machine, speed 0.05 in/min. Original and check computations of yield and strength were then made and the relative economy of mixes was computed. The results

TABLE I

Unit Weights of Dry-Rodded, Mixed Aggregates, Using Moscow Crushed Basalt and Spokane Sand

Proportion Sand to Rock Per Cent	Unit Weight in lbs.
0—100	96.4
30— 70	117.6
35— 65	120.0
40— 60	122.9
45— 55	125.1
100— 0	105.8

TABLE II

Mix, Yield, Strength, & Test Data

* = expt. in error

Vol. Prop Sand-Rock	Dry-Rodded Mix	Lbs. Sand per sk.	Lbs. Rock per sk.	Measured Yield Cu.Ft/Sk.	Computed Yield Cu.Ft./Sk.	Compressive Strength #/in² @ 28-days	Unit Weight Fresh Conc.	Flow Per Cent	Slump Inches	W/C Ratio	Lbs. of Cement in Test Batch	Lbs. of Total Material in Batch
30:70	1:1.47:3.42	155	328	4.12	4.17	2990	152.8	145	1½	0.80	14.5	96.7
35:65	1:1.83:3:40	194	328	4.39	4.42	4110	151.7	130	½		20.0	142.0
40:60	1:1.88:2.79	198	269	4.06	4.08	3720	150.3	145	1½		22.0	143.2
45:55	1:2.17:2.63	229	252	4.21	4.16	3280	149.1	145	¾		20.5	136.9
30:70	1:2.10:4.87	221	469	5.66	5.61	2440	149.9	150	½	1.00	14.0	126.3
30:70	1:1.60:3.73	169	359	4.46	4.50	3230	151.5	130	½	0.85	17.0	122.2
35:65	1:1.83:3.41	194	328	4.42	4.47	3000	151.9	140	¼		20.0	142.7
40:60	1:1.96:2.93	207	282	4.26	4.25	3060	149.1	145	2		21.0	142.1
45:55	1:2.12:2.57	224	246	4.08	4.16	3420	151.6	143	1¾		21.0	138.4
35:65	1:2.45:4.54	260	438	5.67	5.67	2160	151.0	142	¼	1.00	15.0	136.4
30:70	1:1.84:4.28	194	412	5.09	5.02	2840	148.4	135	¾	0.90	16.0	128.6
35:65	1:1.94:3.60	205	346	4.68	4.69	2250	150.1	142	1		19.0	141.8
40:60	1:2.16:3.23	228	311	4.55	4.61	2950	151.6	135	¾		19.0	139.6
45:55	1:2.39:2.85	247	275	4.50	4.51	3720	149.5	155	1		19.0	135.9
40:60	1:2.93:4.38	310	423	6.15*	5.87	2940	144.8*	135	½	1.00	14.0	132.5
30:70	1:1.94:4.53	205	437	5.52*	5.27	2710	143.6*	135	¼	0.95	14.0	118.4
35:65	1:2.29:4.26	243	412	5.41	5.35	2160	149.3	133	¼		16.0	137.5
40:60	1:2.41:3.61	255	348	5.12	5.04	3200	147.8	150	¾		17.0	136.9
45:55	1:2.46:3.00	261	289	4.79	4.72	2490	147.0	190	1¾		18.0	134.9
45:55	1:2.65:3.23	281	312	4.97	5.02	2990	150.6	150	1	1.00	19.0	151.3

appear in Tables 1 to 3 inclusive and in Figures 1a to 3b inclusive. All platted data is based on direct yield measurements.

Conclusions

The following general conclusions may be drawn from the yield study of Moscow crushed basalt rock and Spokane sand concrete, but only under laboratory conditions as specified. Any application to field conditions should be carefully adjusted for those factors controlled or limited in the laboratory and for different inherent qualities of aggregates.

I. (From Fig. 1a). That for given water-cement ratios of 0.85, 0.90, and 0.95, the yield decreases at a nearly uniform rate with increase in the dry-rodded proportion of sand to rock.

TABLE III

Cost of Materials Delivered (Per Cubic Yard of Concrete)

Mix Dry-Rodded	Measured Yield	Batches per Cu. Yd.	Cement Bbls.	Factor Cost	Sand Cu. Yds.	Factor Cost	Rock Cu. Yds.	Factor Cost	Materials Cost Per Cu. Yd. Conc.
1:1.47:3.41	4.12	6.56	1.64	6.56	0.357	1.25	0.828	1.86	$9.67
1:1.83:3.40	4.39	6.14	1.54	6.14	0.417	1.46	0.774	1.74	9.34
1:1.88:2.79	4.06	6.66	1.67	6.66	0.463	1.62	0.688	1.55	9.83
1:2.17:2.63	4.21	6.42	1.61	6.42	0.516	1.81	0.626	1.41	9.64
1:1.60:3.73	4.46	6.06	1.52	6.06	0.359	1.26	0.838	1.89	9.21
1:1.83:3.41	4.42	6.12	1.53	6.12	0.416	1.45	0.772	1.74	9.31
1:1.96:2.93	4.26	6.34	1.59	6.34	0.461	1.61	0.689	1.55	9.50
1:2.12:2.57	4.08	6.62	1.66	6.62	0.519	1.82	0.629	1.42	9.86
1:1.84:4.28	5.09	5.30	1.33	5.30	0.361	1.26	0.841	1.89	8.45
1:1.94:3.60	4.68	5.77	1.44	5.77	0.414	1.45	0.769	1.73	8.95
1:2.16:3.23	4.55	5.93	1.48	5.93	0.474	1.66	0.710	1.60	9.19
1:2.39:2.85	4.50	6.00	1.50	6.00	0.531	1.86	0.633	1.43	9.29
1:1.94:4.53	5.52	4.89	1.22	4.89	0.351	1.23	0.821	1.85	7.97*
1:2.29:4.26	5.41	4.99	1.25	4.99	0.424	1.49	0.787	1.79	8.27
1:2.41:3.61	5.12	5.27	1.32	5.27	0.471	1.65	0.705	1.59	8.51
1:2.46:3.00	4.79	5.63	1.41	5.63	0.513	1.80	0.626	1.41	8.84
1:2.10:4.87	5.66	4.77	1.19	4.77	0.371	1.30	0.860	1.94	8.01
1:2.45:4.54	5.67	4.76	1.19	4.76	0.432	1.51	0.802	1.80	8.07
1:2.93:4.38	6.15	4.39	1.10	4.39	0.476	1.67	0.712	1.60	7.66*
1:2.65:3.23	4.97	5.43	1.36	5.43	0.533	1.87	0.650	1.46	8.76

Table III is based on unit prices of delivered materials as follows:

Cement—$4.00 per bbl.
Sand—$3.50 per cu. yd. dry-rodded volume.
Crushed Rock—$2.25 per cu. yd. dry-rodded volume.

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*Indicates probable experimental errors.

Experimental errors may account for inconsistencies of other curves.

II. (From Fig. 1b). That for a given proportion of sand to rock by dry-rodded volumes, the yield increases as the water-cement ratio increases.

III. (From Fig. 2a). That for a given proportion of sand to rock, the yield increases as the strength decreases.

IV. (From Fig. 2b). That for a given proportion of sand to rock, the strength decreases as the water-cement ratio increases. The best curve fits the most reasonable volume combination, 35:65, and tends to show the typical water-cement ratio curve within the range considered. Series 30:70 is a harsh mix; series 45:55 is over-sanded and departs most markedly from this conclusion.

V. (From Fig. 3a). That for all mixes studied there is a nearly uniform inverse relationship between yield and cost. The cost item for any specific mix investigated should be referred back to Table III.

VI. (From Fig. 3b). That for all proportions, a curve showing the straight line ratio between sand and rock might occur with a water-cement ratio between 0.90 and 0.95.

Recommendations

It is felt that the present study did not furnish adequate control of consistencies and also that a higher average consistency, with a resulting mix of greater plasticity, would give more uniform results. The average consistency used in the present tests, 144, gives a workable concrete for large forms such as abutments, piers, gravity sections, etc., where the mix can be dumped into buckets or cars and then placed directly without the use of flat-gradient chutes or interference from heavy reinforcing. A higher consistency should be used for thin walls, beams, slabs, and other such sections.

Two Consistencies Not Tested

Comparative gravel tests on the two major groups of "stiff plastic" and "semi-wet" consistencies would give a more conclusive yield study. This was not done in the present tests since all gravel is imported, largely from Spokane, and selection must then be based on cost and economy of placing each coarse aggregate concrete type.

Acknowledgment

The present study was suggested by J. E. Buchanan, testing engineer for the University of Idaho, and was approved by Ivan C. Crawford, dean of engineering and director of the Engineering Experiment Station, University of Idaho, Moscow.

The actual tests and computations were made by the writer and three senior students in civil engineering—W. V. Iorns, W. R. Reed, and O. M. Uhl.

Cement Shipments For Five Months Ahead of Last Year

Construction Reports Both Favorable and Unfavorable—Building Permit Values Continue Healthy Trend

Cement shipments in excess of last year, both for the month of May and for the first five months of the year, furnish the outstanding item of favorable construction news.

Building Permit Values Favorable

Official reports of building permits issued in May in 588 cities in all sections of the United States indicate a continuation of the trend toward normal which was first noted in April, according to S. W. Straus & Co.

The value of all permits issued in the 588 cities was $202,231,771 in May, compared with $209,054,406 in April. While this is a decline of about 3 per cent, the normal seasonal decline from April to May is about 12 per cent. In the 25 leading cities the May permits actually exceeded the April permits by 7 per cent.

Construction Contracts Slightly Off

The F. W. Dodge Corporation reports contracts for construction work for public utilities and public works departments in a seasonal decline from the April contracts, and slightly under May, 1929. The Dodge Corporation figures are:

Contracts Awarded in May

	1929	1930
Buildings	$448,377,700	$322,502,900
Public Works and Public Utilities	139,388,200	134,913,100
Totals	$587,765,900	$457,416,000

Contracts Awarded in First Five Months

Buildings	$1,998,777,400	$1,449,992,000
Public Works and Public Utilities	487,138,300	587,822,900
Totals	$2,485,915,700	$2,037,814,900

Contemplated construction dropped off in May, with a total of $643,405,900, compared with $954,618,300 in April and $847,156,600 in May 1929.

Concrete Highway Contracts Continue Heavy

Contracts awarded for concrete highway pavements in May were for the first time this year in smaller volume than in the corresponding month of a year ago; but the total up to June 15th is still well in excess of the contracts awarded in the same period of 1929. The following figures are reported by the Portland Cement Association:

Square Yards of Concrete Pavements Awarded

	January 1 to June 15, 1929	January 1 to June 14, 1930
Roads	45,602,646	58,139,454
Streets	18,487,960	14,822,800
Alleys	1,382,627	963,462
Total Sq. Yds.	65,473,233	73,925,716

Cement Shipments Ahead of Last Year

Shipments of portland cement have exceeded last year's shipments, both for the month of May and for the year to date. In May the shipments were 17,210,000 barrels, compared with 16,706,000 in May, 1929. For the first five months of this year the shipments were 51,343,000 barrels, compared with 51,299,000 in the first five months of 1929.

Mixers Hitched Tandem Increase Output

Batch Every 50 Seconds is Mixed One Minute—Beat Time With Single Mixer by 25 Seconds

Jaicks Brothers, Illinois contractors, have hitched two mixers nose-to-tail to reduce the time required per batch and so increase the output.

The specified mixing time in Illinois is one minute. With one minute mix and ideal operating conditions the accepted time per batch is 75 seconds. By mixing the batch 30 seconds in the first mixer and passing it to the second, where it is mixed another 30 seconds, the time per batch has been reduced to 50 seconds. That means that they have increased their output by 50 per cent.

The mixers are held exactly the right distance apart by a 10 by 10 timber extending between them. This distance must be constant, and exactly right, because the first mixer discharges into the skip of the second. If they were too far apart the concrete would pile up in the skip and overflow at the end; if too close the rising skip of the second mixer would strike the discharge chute of the first and tear it off.

Two mixers, hitched tandem, each mixing 30 seconds of the specified minute mixing time, have increased output 50 per cent

Only six more workmen are required than for a single mixer. Five men are used in transferring batch boxes from industrial trains to the skip of the first mixer; one cleans the partly mixed concrete from the discharge chute of the first mixer, and six level the concrete ahead of the finishing machine.

No additional men are needed at the proportioning plant, in hauling, form setting or finishing. One mechanical finisher levels and compacts the concrete.

Although the new system has been operating too short a time to hang up any production records, stop watch records of the time required to unload individual trains show an average output of 70 batches per hour. And no more time is lost in switching or plant breakdowns than for a single mixer. The only cause for "additional" delay would be a breakdown in the first mixer. And if that occurred batches could be dumped into the skip of the second, mixed a full minute, and discharged in the regular manner.

Perhaps in the near future all paving jobs will be equipped with tandem mixers.

Civil Engineers' Society Meeting

The 60th annual convention of the American Society of Civil Engineers will be held July 9th to 12th at Cleveland, Ohio, with headquarters at the Hotel Cleveland.

Preparing Concrete Masonry Advertising

Newspapers Found Best Medium for Local Manufacturer—Helpful Hints on Display Advertising, Copywriting and Planning Campaigns

By T. A. DAY

MANUFACTURERS of concrete masonry units who sell according to a well-organized plan of merchandising are the ones who get ahead. They are developing substantial markets through personal selling backed by effective advertising. Consistently and properly used, advertising becomes a very important factor in any sales campaign.

Although there are various kinds of advertising which concrete masonry manufacturers can use, this article deals only with display advertising; that is, advertisements which are placed in such media as newspapers and magazines.

Medium Is Important

Choosing the method or medium by which a message concerning concrete masonry is carried to prospective customers is the first step in outlining an advertising campaign. In fact, the medium used is almost as important as the message itself. The prospective users of concrete masonry building units include architects, building contractors, speculative builders, realtors, farmers, potential home owners, mason contractors and indirectly the agencies which finance and insure buildings of all kinds. To reach each of these groups is a local problem. However, the principal media available for concrete masonry advertising include building sections of local newspapers, local magazines for contractors or realtors, local farm papers, and similar publications.

Probably the best medium for the local manufacturer is the newspaper reaching the prospective home owners in his community, that is, if he intends to spend his advertising money in the residential field. Some local newspapers publish series of pictures, floor plans and articles on home owning, building and financing, many of them devoting a special page each week to such features. For this reason an advertising program for concrete masonry accomplishes best results when it includes some newspaper advertising. Choose the newspaper that will carry the message to the greatest number of prospects, the most suitable type of newspaper being the one that consistently supports the best interests of the community.

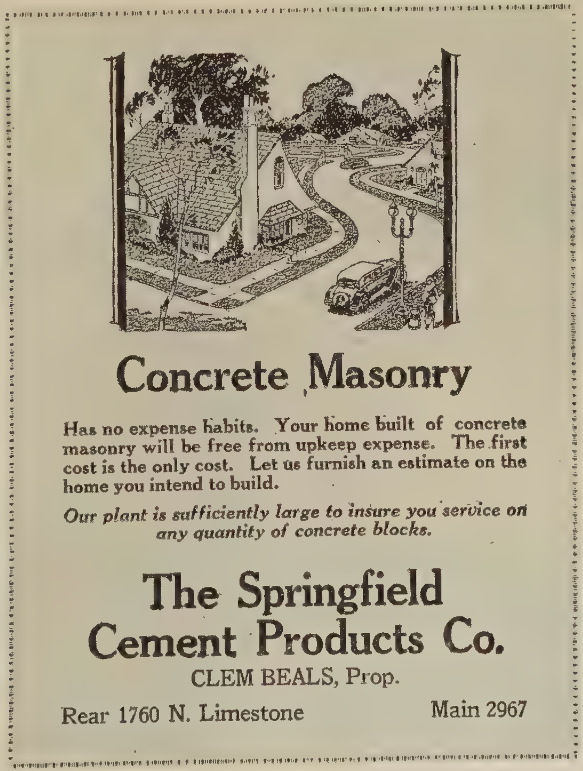
The Architects' Small House Service Bureau is contributing a great deal to the value and interest of home building pages in newspapers throughout the country. This organization provides newspapers subscribing to its service with material of interest to prospective home builders.

Decide *now!*

Our national fire loss is at the rate of $18 every second. Decide now that YOUR home, the one you plan to build, will be *firesafe*. Concrete masonry will assure such safety, and besides will give you a home of enduring beauty—one that you will be proud to call your own.

Before you build investigate concrete masonry

An example of effective advertising without illustrations. Well worded, such an "ad" serves effectively to keep the manufacturer's name before the public



Concrete Masonry

Has no expense habits. Your home built of concrete masonry will be free from upkeep expense. The first cost is the only cost. Let us furnish an estimate on the home you intend to build.

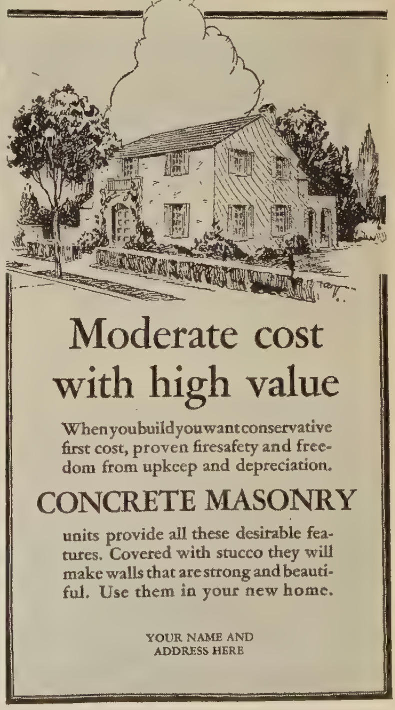
Our plant is sufficiently large to insure you service on any quantity of concrete blocks.

The Springfield Cement Products Co.

CLEM BEALS, Prop.

Rear 1760 N. Limestone Main 2967

This advertisement tells the prospective home owner several things, leading him to ask more about concrete masonry homes



Moderate cost with high value

When you build you want conservative first cost, proven firesafety and freedom from upkeep and depreciation.

CONCRETE MASONRY

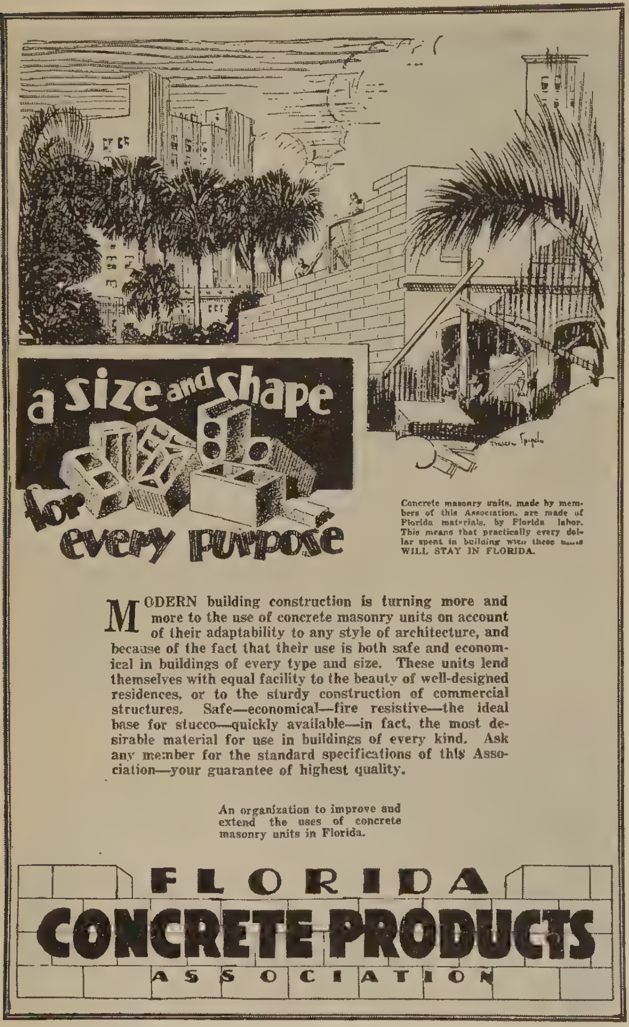
units provide all these desirable features. Covered with stucco they will make walls that are strong and beautiful. Use them in your new home.

YOUR NAME AND ADDRESS HERE

Showing how inexpensive pen-and-ink sketches add to the effectiveness of advertising

Attractive sketches of houses, floor plans and educational copy are published in prominent positions on the home building page.

Of interest to concrete masonry manufacturers is the fact that the Architects' Small House Service Bureau, through its subscribing newspapers, has already published 32 house plans designed strictly for concrete masonry materials, specifying concrete masonry walls, portland cement stucco, concrete first floors and concrete roof coverings. Newspapers in leading concrete masonry centers throughout the United States since 1928 have featured these, and others are being made ready for publication this year.



a size and shape for every purpose

Concrete masonry units, made by members of this Association, are made of Florida materials, by Florida labor. This means that practically every dollar spent in building with these units WILL STAY IN FLORIDA.

MODERN building construction is turning more and more to the use of concrete masonry units on account of their adaptability to any style of architecture, and because of the fact that their use is both safe and economical in buildings of every type and size. These units lend themselves with equal facility to the beauty of well-designed residences, or to the sturdy construction of commercial structures. Safe—economical—fire resistive—the ideal base for stucco—quickly available—in fact, the most desirable material for use in buildings of every kind. Ask any member for the standard specifications of this Association—your guarantee of highest quality.

An organization to improve and extend the uses of concrete masonry units in Florida.

FLORIDA
CONCRETE PRODUCTS
ASSOCIATION

Although this advertisement is a good example of co-operative advertising, it does not tell the reader where he can obtain concrete masonry units. Each member's name and address should have been given

Reproductions of twenty of the most popular of the bureau's designs for concrete masonry houses are available for use in sales campaigns. The suggested use of these is to offer them, through an advertisement in local newspapers, as suggested plans for concrete masonry houses. The designs mentioned, which are available from the Portland Cement Association, Chicago, are printed on letterhead size sheets, the reverse side of each carrying information on some use of concrete for home construction. There is also ample space for imprinting the manufacturer's name and address.

It is generally agreed that the manufacturer can make no better investment in his merchandising program than to tie in his newspaper advertising with the educational copy provided by the Architects' Small House Service Bureau. In many instances the house plan it features is carefully studied by the entire family of the man who intends to build, and decisions usually are made at this time as to what materials the home builder is going to want in his new home. The progressive manufacturer makes sure that an advertisement, describing his concrete masonry products and listing his name and address, appears on this page. By placing his advertisement in the issues in which a concrete masonry house is described, he obtains three or four times the advertising space devoted to concrete masonry that he would ordinarily obtain should he place his advertising in any other section of the paper.

Because the first function of any advertising is to make a product known, thereby paving the way for personal selling, it is important that the manufacturer first acquaint the public with what concrete masonry really is. It is recommended that he publish the following definition as often as possible on letterheads, in newspaper and magazine advertising, and on any printed matter referring to his company's products:

> "Concrete masonry is a term applied to block, brick, or tile building units molded from concrete and laid by a mason in a wall. The concrete is made by mixing portland cement with water and other suitable materials, such as sand, pebbles, crushed stone, cinders, burned shale, or slag."

When preparing advertising copy it is well to remember that the advertisement must make contact with the reader just as the salesman does with the prospect. The salesman who approaches a prospective home owner and blurts out, "Build that concrete masonry house today!" is in the same objectionable class with an advertisement which uses similar words in bold, black type. It is better to say, "Will your new home be expense-proof?" or "Will your new house be firesafe?" and then explain how, through the use of concrete masonry, the new residence may be made safe against depreciation or be made fire-resistive at moderate cost.

Illustrations Not Necessary

Advertisements need not necessarily be illustrated, although appeals to the imagination by illustrated advertisements have in a large measure been responsible for creating the desire for new products. Illustrated advertising should stimulate the "pride of ownership" in the reader.

Headings of advertisements are important. One advertisement illustrated here is headed: "A size and shape for every purpose." This example of co-operative advertising, published by the Florida Concrete Products Association, is effective in that it attracts the reader's attention. This is likewise true of the Springfield Cement Products Company's advertisement which tells that "Concrete masonry has no expensive habits."

Small advertisements published regularly without illustration, if well-worded, serve to keep the manufacturer's name and products before the public. Several examples of these are given here:

A suggested heading is "A Sound Investment"; this can be followed by: "You wouldn't make an investment in bonds without considering safety—security. When you are planning a home you should look ahead the same way. Concrete masonry assures a home of low depreciation, low maintenance and high resale value. Concrete block or building tile are strong, firesafe and permanent. Before you build investigate concrete masonry."

"An Economical Home" is another suggested heading, to be followed by this appeal: "An economical home is assured by using concrete masonry from footings to eaves.

Such a home actually costs less in the long run. Often the first cost is lower than you would pay for less durable construction. Before you build investigate concrete masonry."

Another advertisement, headed "Decide *now!*" is reproduced here to show how the foregoing examples will look in type. The space left blank at the bottom can be used for the manufacturer's name and address. There is also sufficient space for printing the definition of concrete masonry mentioned earlier in this article.

Other similar advertisements, in which pen-and-ink sketches have been used as illustrations, are also reproduced here.

Concrete Blocks

FOR STUCCO BUILT HOMES AND MASONRY CONSTRUCTION.

ECONOMY
PERMANENCY
COMFORT

Concrete Products Mfrs. of Akron

The concrete products manufacturers of Akron, Ohio, agree that this is a good example of poor advertising. They have learned that it is better to advertise what the consumer really gets—the permanent, firesafe home — instead of concrete blocks. Advertisements like this are "buried" on the page and are a waste of money

Success in advertising depends greatly upon the ability of the advertiser to make the reader remember him and his product. Advertisers rely upon repetition of outstanding points to help them obtain new acquaintances and additional users.

Advertising copy should have the power to interest and convince the reader. It may be informing or reminding copy. Informing copy usually consists of a logical argument on behalf of the commodity, a short story woven around the use of the product, a testimonial from a user or observer, a point about the product which has current news value, or service information on the use of the product.

Picturing the product attractively is the best substitute for showing the actual product and, like the merchant who has found that he sells more goods by placing them where they may be seen, the advertiser uses effective illustrations for his appeal. The function of the illustration is to draw attention, to cause the reader to visualize the product and its distinctive features, to show how the product is used, and to picture the advantages resulting from its use.

The following paragraphs can be used by manufacturers who are writing copy about concrete masonry or who are having it written. Advertising alone will not sell concrete masonry, however; it must be followed up regularly with aggressive sales effort, personal selling by well-trained salesmen.

"It is easy to understand why an ever-increasing number of fine homes are being built with concrete masonry walls. This type construction not only assures utmost durability and strength, but—of even greater importance to the owner of every fine home—*Firesafety!*

"Here is complete protection for your investment in the home itself and its furnishings. Rare libraries that can never be replaced, costly rugs and tapestries, prized trophies and mementos of earlier years—for the loss of these no insurance can adequately compensate. They must be safeguarded from fire."

* * *

"For the formal mansion on the suburban estate—or the modest bungalow—modern concrete masonry construction offers equal and definite advantages.

"In large homes or small, concrete masonry permits unique beauties of design and finish, both exterior and interior. It provides absolute firesafety. It minimizes upkeep expense. Its cost is moderate, permitting important economies whatever the size of the dwelling.

"Householders and architects who are interested in the modern trend in homes appreciate that the architectural possibilities of concrete masonry are virtually unlimited."

* * *

"Popular sentiment has long demanded firesafety in schools, hotels, apartments and public buildings. Surely it is of equal importance that *your home* be as nearly firesafe as you can make it.

"*Concrete masonry* construction is finding universal favor with home builders and architects—for it provides not only firesafety, but enduring beauty and economy.

"Many delightful exterior effects may be attained with concrete masonry. Facings of portland cement stucco, face brick or cast stone are widely used. Exposed masonry surfaces, too, are suitable for many architectural treatments.

"There is genuine economy in building a home with exterior and partition walls of concrete masonry. Before you build a home of *any* size, learn the facts about modern concrete masonry construction."

"Calculating Strength of Steel Beams Encased in Concrete"—Correction

Two corrections are required in the article published under the above title in the June issue of CONCRETE beginning on Page 35.

They are as follows: The first half of Formula 14, on Page 36, should have read

$$\frac{1}{n}(b - b_1)\frac{(kd)^3}{3} = A'_s f^2 \text{ or . . .}$$

On Page 37, the fifth calculation on the page should have read

$$\frac{I_s M}{I M_s} = 0.64 \times 1.13 = 0.725 \text{ or 27.5 per cent decrease of}$$

deflection.

Ray Wilson Succeeds Newton as Conservation Engineer

Raymond Wilson has been appointed conservation engineer of the Portland Cement Association, succeeding H. W. Newton, recently resigned. Mr. Wilson has been in the employ of the Portland Cement Association since 1921. Until his promotion to this position, Mr. Wilson was associate chemist in the research laboratory, where he conducted a number of researches on the uses of color in concrete. He also investigated some of the physical factors affecting the durability of concrete.

Mr. Wilson graduated from the University of Chicago in 1916. He served during the war in the Twelfth Aero Squadron on the French front.

How to Save in
Concrete Form Work

Forms for Ordinary Exterior or Interior Bearing Walls, Curtain Walls, or Pilaster-Supported Walls Are Included in This Seventh Installment—Erecting and Joining—Placing Window Frames—Rate of Placing

VII—Forms for Walls Above Grade

By A. B. MacMILLAN
Chief Engineer, Aberthaw Co., Boston, Mass.

THE first article of this series, printed in the January, 1930, issue of CONCRETE, contains a description of form work for foundation walls. For instance, Figure 7 illustrates a typical wall form assembly where wall form units 30 in. high are employed. Figure 8 illustrates a concrete separator, or spreader, used in combination with a tie bolt so as to eliminate exterior bracing. The wooden mold for casting the concrete spreader also is illustrated in Figure 8.

The present article deals with form work for walls above grade. These walls may be ordinary exterior or interior bearing walls; or they may be curtain walls extending between pilasters, supported on their own footings but carrying nothing except their own weight; or they may be supported by the pilasters and have no footings of their own.

Size of Wall Form Panels

The use of the 30-in. wall form units employed in foundation wall construction (Figure 7) is not usually advisable above grade, where the truest possible alignment is needed. Better workmanship is obtained if the form panels are built to the size of an entire wall panel, extending from pilaster to pilaster and from floor to floor. In this way it is possible to set false frames for windows and similar openings into place within the wall forms at the time the forms are erected. However, where there is a possibility of re-using the panels, smaller panels will be more economical.

Description of Wall Form Panel

Figure 37 contains details of a typical wall form assembly, of the type used either in straight wall work or in conjunction with the form work for wall columns or pilasters. Figure 38 shows sections through the wall forms in greater detail, sizes of lumber and tie bolts being given.

Height of Wall Form Panels

The inside panel, as shown at the right side of Figure 37, extends from the completed floor or other support to the underside of the form boards for the floor above.

The height of the outside panel will depend on the position of belt courses or similar details. Wherever a belt course occurs near a floor the outside panel will of course extend up to the form construction for the belt. If there is no belt course or similar detail to deal with, the outside panel must in any event extend a few inches above the upper surface of the floor, so that a low wall course may be formed to aid in aligning the form panels for the next story. This detail is seen in the upper right-hand part of Figure 37.

Detail of Waling Strips

Particular attention is invited to the detail of the waling strips shown in Figure 38. Previous illustrations in this series (Figure 7) show waling strips, or timbers, of 4 by 4 material, in which holes are drilled for the tie bolts. A much better waling strip is shown in Figure 38. It consists of two 2 by 6 timbers spiked together through fillers of 1 by 6 material the fillers being placed about 3 ft. apart. This permits the tie bolts to be inserted anywhere, except where the fillers occur. On construction work where a great number of waling strips are required, labor costs can be reduced by having them made as detailed in Figure 38.

Erecting the Wall Form Panels

Space should be found to build the wall form panels for the first story in a lying-down position alongside the place where they are to be erected. First the waling strips are laid down, the vertical studs are tacked to them with double-headed nails, after which the form boards are nailed to the studs. Care must be taken to see that when the panels are raised into position, each waling strip is at the same level as the corresponding strip on the opposite side of the wall. The panels are then raised from both sides, joined up with the column or pilaster forms similar to the manner shown in Figures 39 and 40, and the tie bolts and concrete or wooden spreaders are placed and tightened up. False frames for windows and other openings are set against the outside panel before the inside panel is raised.

On upper stories space must be provided for assembling the inner form panel in a lying-down position on the floor construction. The outside panel may be built on the ground and hoisted into place.

Form Work for Pilasters

The form work for the wall pilasters is erected independently in the manner described for wall and corner columns in the March installment of this series.

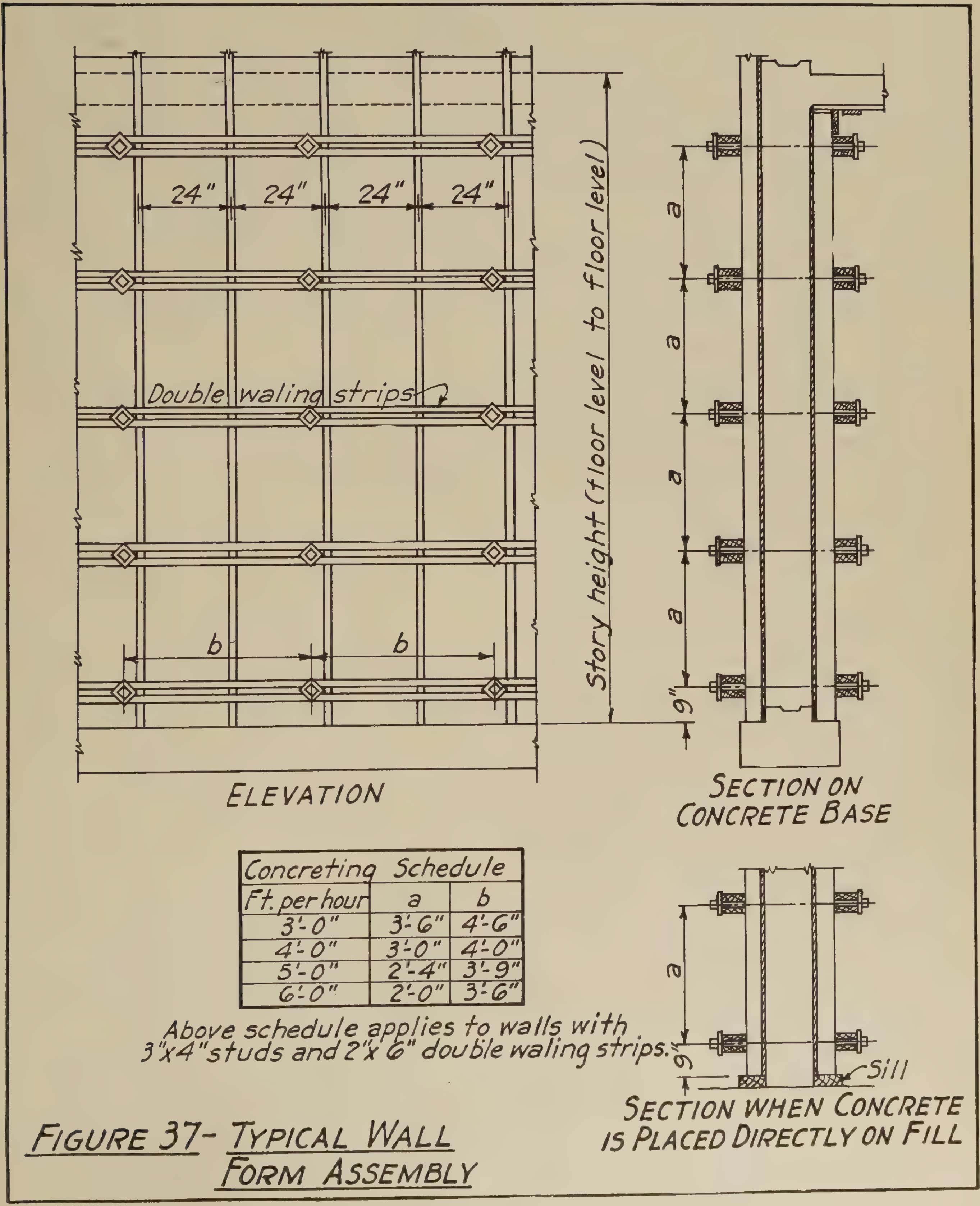
The pilaster form work should be erected and thoroughly braced before the wall form panels are raised into position, so as to provide secure anchorage for the latter.

Joining Wall Forms to Pilaster Forms

The details and notes on Figures 39 and 40 show quite clearly the manner in which the wall forms are joined to the forms for pilasters or columns. The pilaster forms, as just stated, are erected and securely braced before the wall form panels are raised into position.

Where the conditions are as in Figure 39, with an offset on both sides of the wall, the pilaster tie bolts on the side toward the wall form panel may be temporarily omitted. That side of the pilaster form may be held for the time being by a cleat of 1-in. material, nailed by double-headed nails against the inside of the pilaster form as shown in dotted lines in the upper left-hand part of Figure 39. After the wall panels are in position, the tie bolts are placed and the temporary cleats are removed.

Where the wall is flush with the pilaster on one side, as in Figure 40, the wall form on the flush side is extended to become the form for that side of the pilaster. On the other side, where the offset occurs, the detail is


24"
24"
24"
24"
Double waling strips
b
b
Story height (floor level to floor level)
ELEVATION
a
a
a
a
a
9"
SECTION ON CONCRETE BASE
a
9"
Sill
SECTION WHEN CONCRETE IS PLACED DIRECTLY ON FILL

Concreting Schedule		
Ft. per hour	a	b
3'-0"	3'-6"	4'-6"
4'-0"	3'-0"	4'-0"
5'-0"	2'-4"	3'-9"
6'-0"	2'-0"	3'-6"

Above schedule applies to walls with 3"x4" studs and 2"x 6" double waling strips.

FIGURE 37– TYPICAL WALL FORM ASSEMBLY

similar to that in Figure 39.

A Wall Without Pilasters

Long stretches of concrete walls without pilasters or offsets occur frequently in foundations, but seldom above grade. When this condition does occur above grade, the form work is built and assembled in a series of panels of story-height, the abutting edges of the panels being detailed exactly as shown for the smaller foundation wall form units in Figure 7 of the January installment of this series. As there shown, a 1-by-6 cleat is nailed 2 in. from the edge of one of the panels, while the vertical 3-by-4 stud on the other panel sets about 1½ in. beyond the ends of the form boards. This overlap of 1½ in. provides a face against which the boards of the first panel are supported.

Proper alignment from panel to panel is aided by staggering the waling strips so that about half of them extend across the joints at least as far as the second vertical stud.

Placing False Window Frames

False frames for windows and other openings are set against the outside form panel before the inside panel is placed into position. A detail of a false window frame is given in Figure 41, while Figure 42 illustrates several panels with such frames in position.

The use of false frames for wall openings is necessary for the reason that if the actual frames were used they might become distorted during the placing of concrete and lead to costly trouble while installing the sash and doors later.

The false frames illustrated in Figures 41 and 42 are to be left in place. Consequently they must be made large enough to receive the regular frames for the openings, allowance being made for a play of ¼ to ½ in. all around. This play will provide for possible distortion and allow space for caulking the regular frame.

Distortion can be avoided to a large extent if the corners of the false frames are made as detailed in the circle in Figure 41. If made in this way, the top piece of the frame has room to swell when saturated with water from the fresh concrete.

Placing Concrete Under Openings

If the false frame is not more than 3 ft. wide, or thereabouts, the fresh concrete may be puddled underneath the frame and against its bottom face by placing the concrete from one side of the frame only. The concrete is puddled as it is being placed, and the process is kept up until it has come through underneath the frame and appears on the other side. If the frame is more than 3 ft. wide it is best to leave a gap in the bottom piece, as shown in Figures 41 and 42, so that the fresh concrete can be puddled through this gap. It is necessary, of course, to cut an opening into the inside wall panel just above the bottom of the frame, to provide access to this point.

When the puddling is completed a board is nailed across the gap in the false frame, as shown in Figure 41.

Rate of Placing Concrete

In the lower left-hand part of Figure 37 the reader will find a "Concreting Schedule." This schedule is very important, for it establishes the rate at which the concrete may be placed without the danger of causing bulging of the form boards. Considered in another way, this little schedule determines the closeness of spacing of waling strips and vertical studs required for a pre-determined speed of concreting.

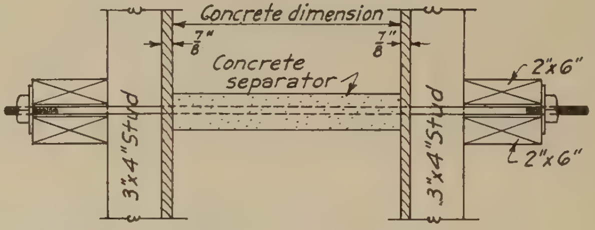
Thus, if the construction superintendent estimates that he will not place concrete in the walls faster than 3 ft. of depth per hour, the schedule in Figure 37 indicates the waling strips may be 3 ft. and 6 in. from center to center, and the vertical studs may be spaced 4 ft. and 6 in. On the contrary, if it is probable that the concrete will be placed at the rate of 6 ft. of depth per hour, the waling strips should be spaced 2 ft. and the vertical studs 3 ft. and 6 in.

Stripping the Forms

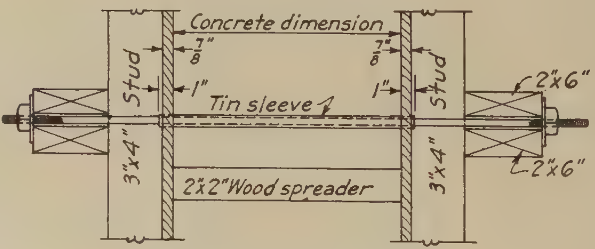
Wall forms may, under ordinary warm weather conditions, be stripped in two days. During cold weather, it is well to leave them in position four days, even though the work is well protected and warmed with salamanders.

There is no particular difficulty involved in removing the wall panels, provided proper forethought has been taken. Observe, for instance, in the upper right-hand part of Figure 37, that the inside wall form panel may be removed without disturbing the form work for the floor above it. Likewise, if the outside panel is not removed before the panel of the next story is in position, the upper panel must be placed so as not to interfere with the removal of the lower.

Whether or not the wall form panels of one story can be used in a higher story depends on the presence or absence of details such as belt courses and cornices; or it may depend on whether the story-heights are equal or



(a) Section thru wall at bolt
(With concrete separator)



(b) Section thru wall at bolt
(With wooden spreader)

Notes:-
Bolts:-
Use $\frac{3}{4}$" or $\frac{5}{8}$" bolts. Never use wire.
Bracing:-
Walls should be well braced at top and bottom and if over 6 ft. high they should be braced at 6 ft. vertical intervals.
Sleeves:-
Use tin sleeves in walls over 8" thick. Sleeves should be 2" longer than the thickness of the wall and $\frac{1}{8}$" larger in inside diameter than the diameter of the bolt.
Spreaders:-
Use spreaders in all walls and make sure that there is at least one spreader at or near each bolt to prevent the wall from being drawn in when bolting up. When not practicable to make concrete spreaders such as illustrated in FIGURE 8, in the January installment of this series, and in the upper part of this FIGURE, wooden spreaders may be used.

FIGURE 38- DETAILS AND NOTES ON TYPICAL WALL ASSEMBLY

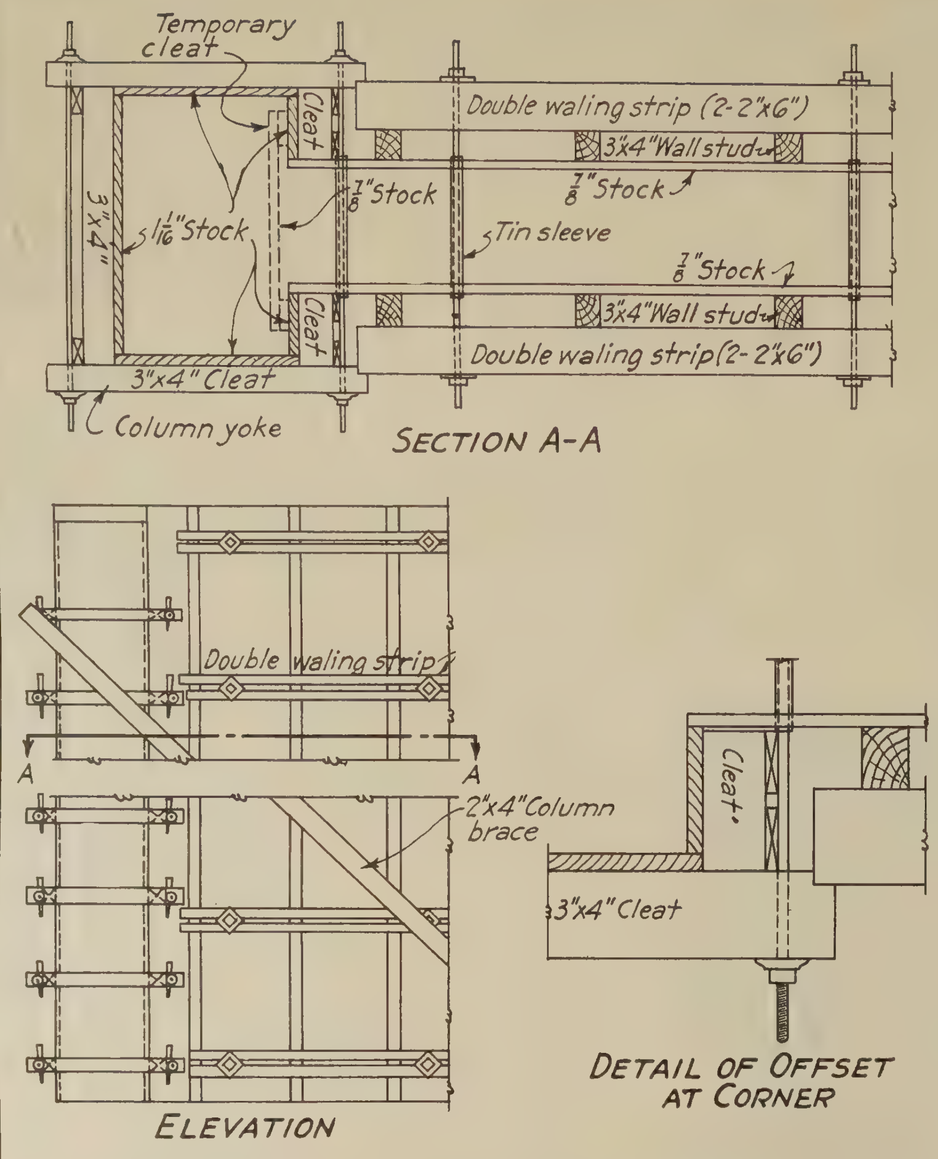
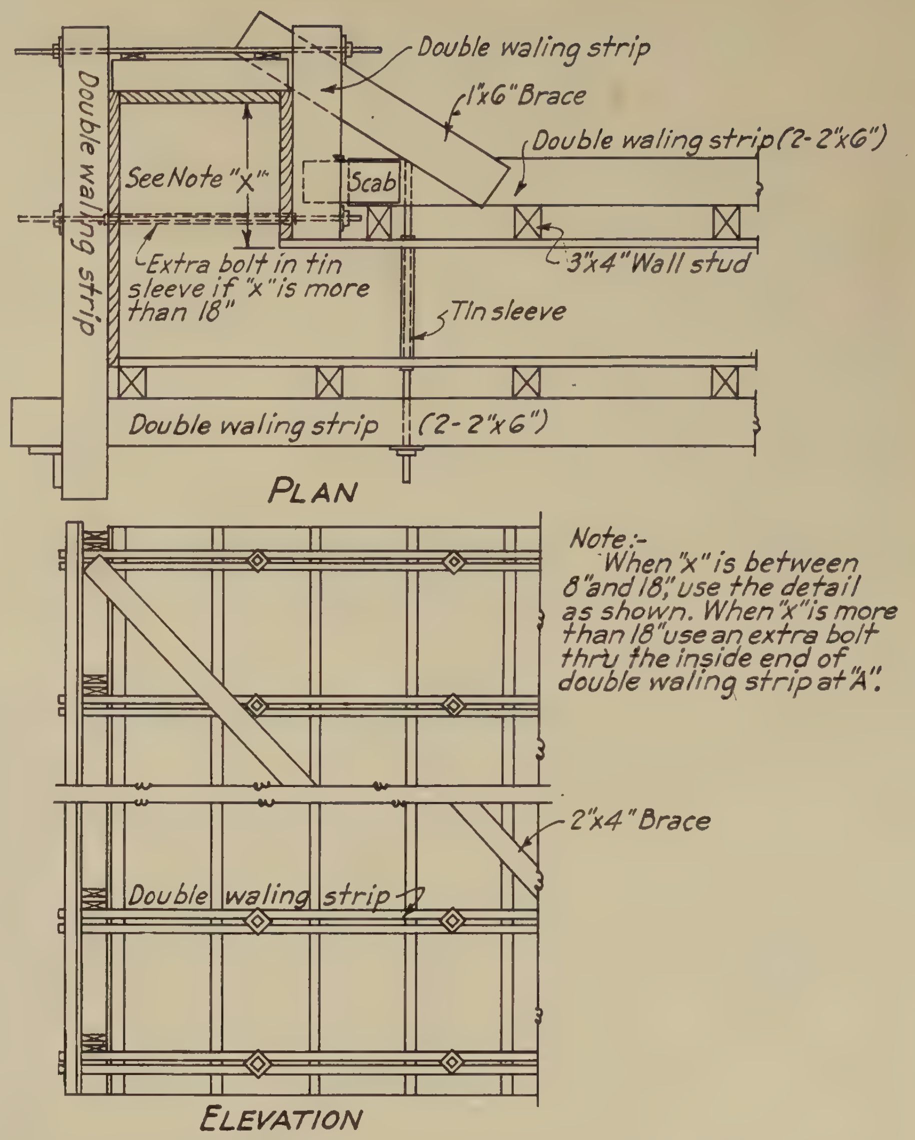


FIGURE 39—DETAIL WHERE WALL FRAMES INTO COLUMN OR PILASTER (WALL OFFSET ON BOTH SIDES)



Note:- When "x" is between 8" and 18", use the detail as shown. When "x" is more than 18" use an extra bolt thru the inside end of double waling strip at "A".

FIGURE 40—DETAIL WHERE WALL FRAMES INTO COLUMN OR PILASTER (WALL FLUSH WITH ONE SIDE)

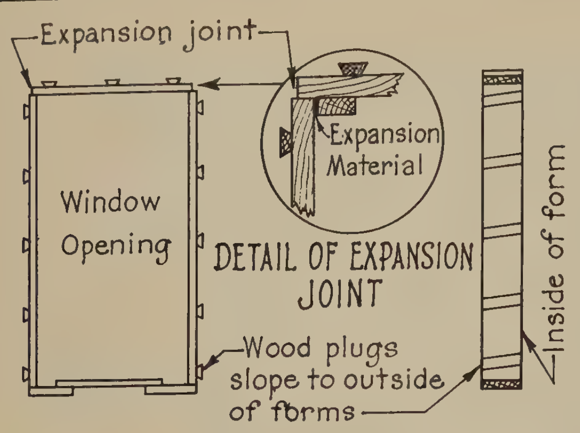

Expansion joint
Expansion Material
Window Opening
DETAIL OF EXPANSION JOINT
Wood plugs slope to outside of forms
Inside of form

FIGURE 41—DETAIL OF FALSE WINDOW FRAME

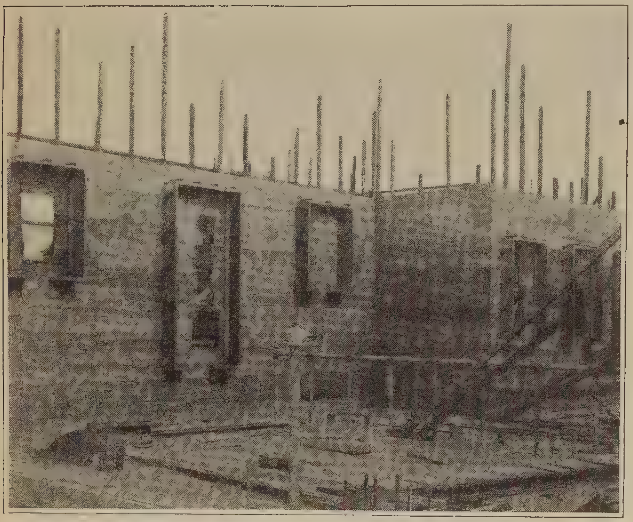


Figure 42. False window frames in position, with openings in bottom of frames to permit puddling of concrete

different. Usually some alteration of a panel is necessary before it can be used again. Outside panels may be let down to the ground for alteration. The inside panels which are to be used again in higher stories are, of course, too large to be taken out through the window openings; consequently it is best to cut them horizontally into two or three parts. This is done by cutting the vertical studs about an inch above a joint between form boards. When the parts are re-assembled the studs are spliced with scabs of 1-by-6-in. material, 18 in. long, nailed against both sides with double-headed nails, much as the foundation wall form units shown in Figure 7 are joined.

So long as the outside panel remains a single unit, proper alignment of the inside panel may be maintained even if it is cut into several parts and later re-assembled.

Raise Allowable Combustible Content Now in Cinder Aggregate

Manufacturers of cinder concrete masonry who are listed with the Underwriters' Laboratories, Inc., are to benefit by a revision of the concrete block standard. Whereas the maximum allowable content of combustibles in cinder aggregate formerly was 20 per cent, it has now been raised to 35 per cent. A test recently conducted in a panel of cinder-concrete block, having 20, 35 and 45 per cent of combustible content, has resulted in the new specifications being written. The new percentage—35 per cent—has been established as standard. The block used for the test were made in the research laboratory of the Portland Cement Association, Chicago.

H. M. Robinson, service engineer for the Underwriters' Laboratories, reports that the April 9th fire test resulted in a recommendation being made to the Fire Council to revise the concrete block standard to permit the use of cinders containing 35 per cent combustible material. No adverse comments having been received from the Fire Council on the recommended change in the combustible limit, the Concrete Block Standard and Inspection Service Procedures for all listed cinder block manufacturers have been revised to include the following requirement, which supersedes the old specification limiting combustible content to 20 per cent by weight:

> When cinders are used, the average combustible content of the mixed fine and coarse aggregate shall not exceed 35 per cent by weight of the dried mixed aggregates.
>
> Note: In general, acceptable results of a single analysis shall suffice to indicate compliance of a specific lot of material with this specification. In case of question as to compliance of material with the requirement, this average shall be determined by analysis of not less than three samples representative of the lot, and in no case shall an individual sample contain more than 10 per cent by weight of combustible material in excess of the specified average.

It is understood that this new specification covering cinder-concrete masonry units has been sent out to rating bureaus and is now in effect. This will greatly increase the cinders that will be acceptable for block manufactured under the Underwriters' Laboratories' Inspection Service, the former 20 per cent requirement having acted as a considerable handicap in certain sections of the country.

In his report to the Fire Council of the Underwriters' Laboratories, J. B. Finnegan, associate engineer of the Protection Department, made the following recommendation:

"The results of the test warrant the opinion that cinder concrete blocks, containing not more than 35 per cent combustible material in their aggregate, and complying in all other respects with the existing standard, should be considered eligible for Listing as Standard, with a fire retardant classification of 3-hr. It is the intention of the staff, therefore, to amend the Standard and Inspection Service Procedures, to specify a 35 per cent maximum instead of the 20 per cent maximum now in effect, unless otherwise directed by the Council within 10 days."

Operators of Transit Mixed Concrete Equipment Organize

The Association of Paris Transit Mixed Concrete Manufacturers was formed as a result of a meeting held in Chicago in April and attended by operators, from all parts of the country, of this type of concrete manufacturing equipment.

The officers elected to head the national organization were Porter W. Yett, Portland, Oregon, president; Charles P. Maloney, Washington, D. C., secretary; and Bruner R. Penniman, Dallas, Texas, treasurer.

Coming Conventions

July 9 to 12—American Society of Civil Engineers, sixtieth annual convention. Hotel Cleveland, Cleveland, Ohio.

July 10—National Ready-Mixed Concrete Association, organization meeting, William Penn Hotel, Pittsburgh, Pa.

Reinforced Concrete Design Simplified

Chart O_1 (2,000; 15)
Chart O_1 (3,000; 10)
A. C. I. Tied Columns

By JAMES R. GRIFFITH
Professor of Structural Engineering, Oregon State Agricultural College

American Concrete Institute Building Code

$f'_c = 2{,}000$ lbs. per sq. in.

$n = 15$

$f_c = 0.225\, f'_c = 450$ lbs. per sq. in.

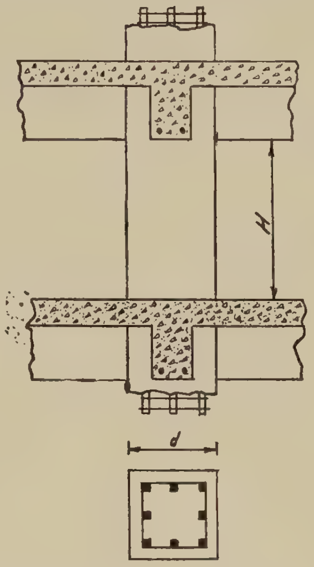
$f'_c = 3{,}000$ lbs. per sq. in.

$n = 10$

$f_c = 0.225\, f'_c = 625$ lbs. per sq. in.

$P = f_c A_G\, [1 + (n - 1)\, p]$

H/R less than 40



THE Building Code of the American Concrete Institute is more liberal for tied columns than the Joint Committee Specifications, allowing a higher unit stress in the concrete. Otherwise the methods of figuring are identical.

The two charts herein presented solve tied columns for 2,000 and 3,000 pound concrete under the A. C. I. Code.

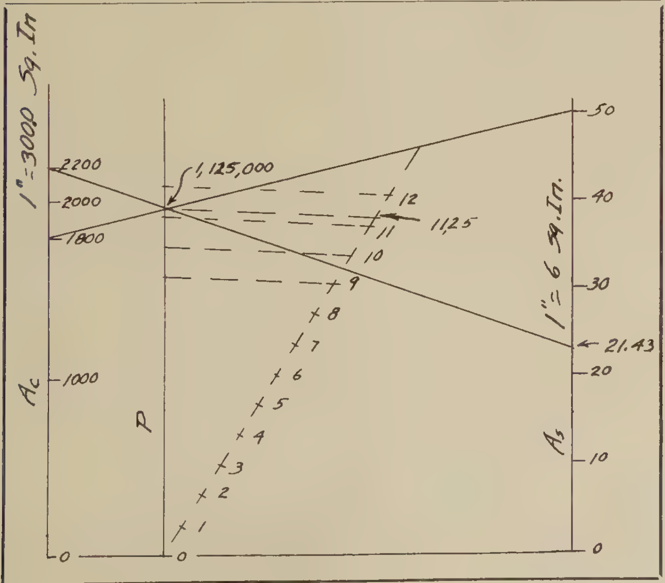


Figure 1-O_1

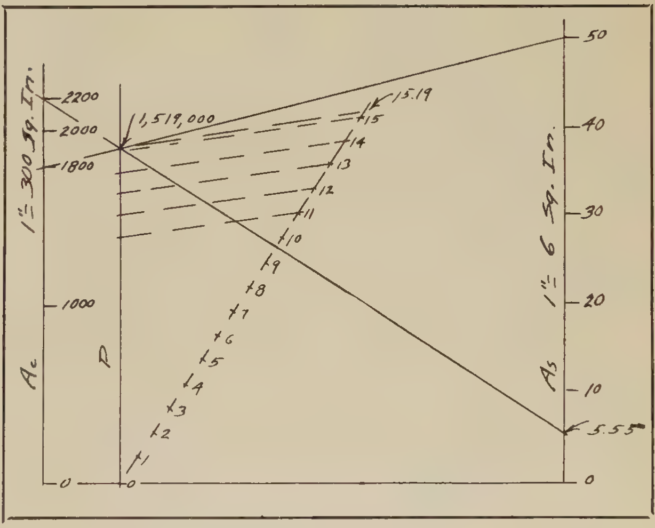


Figure 2-O_1

On the original Chart O, a solution isopleth was shown for a tied column having a total load of 400,000 lbs. A 28-inch square column with 15.2 sq. in. of longitudinal reinforcing was obtained.

Using the same column load as above, I have shown solution isopleths on the two new charts, and obtained the following conditions:

Column load = 400,000 lbs.

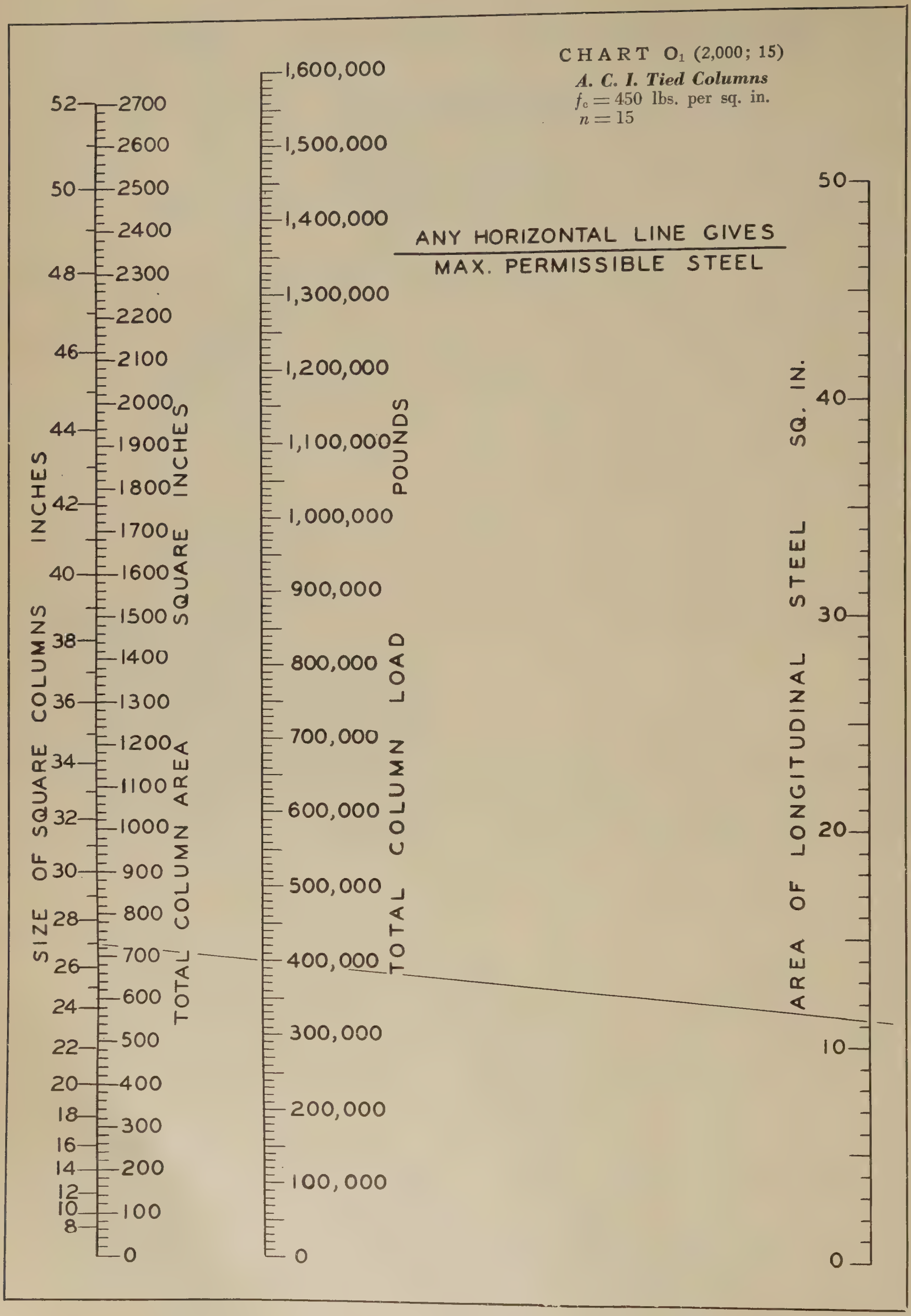


CHART O_1 (2,000; 15)

A. C. I. Tied Columns

$f_c = 450$ lbs. per sq. in.

$n = 15$

ANY HORIZONTAL LINE GIVES MAX. PERMISSIBLE STEEL

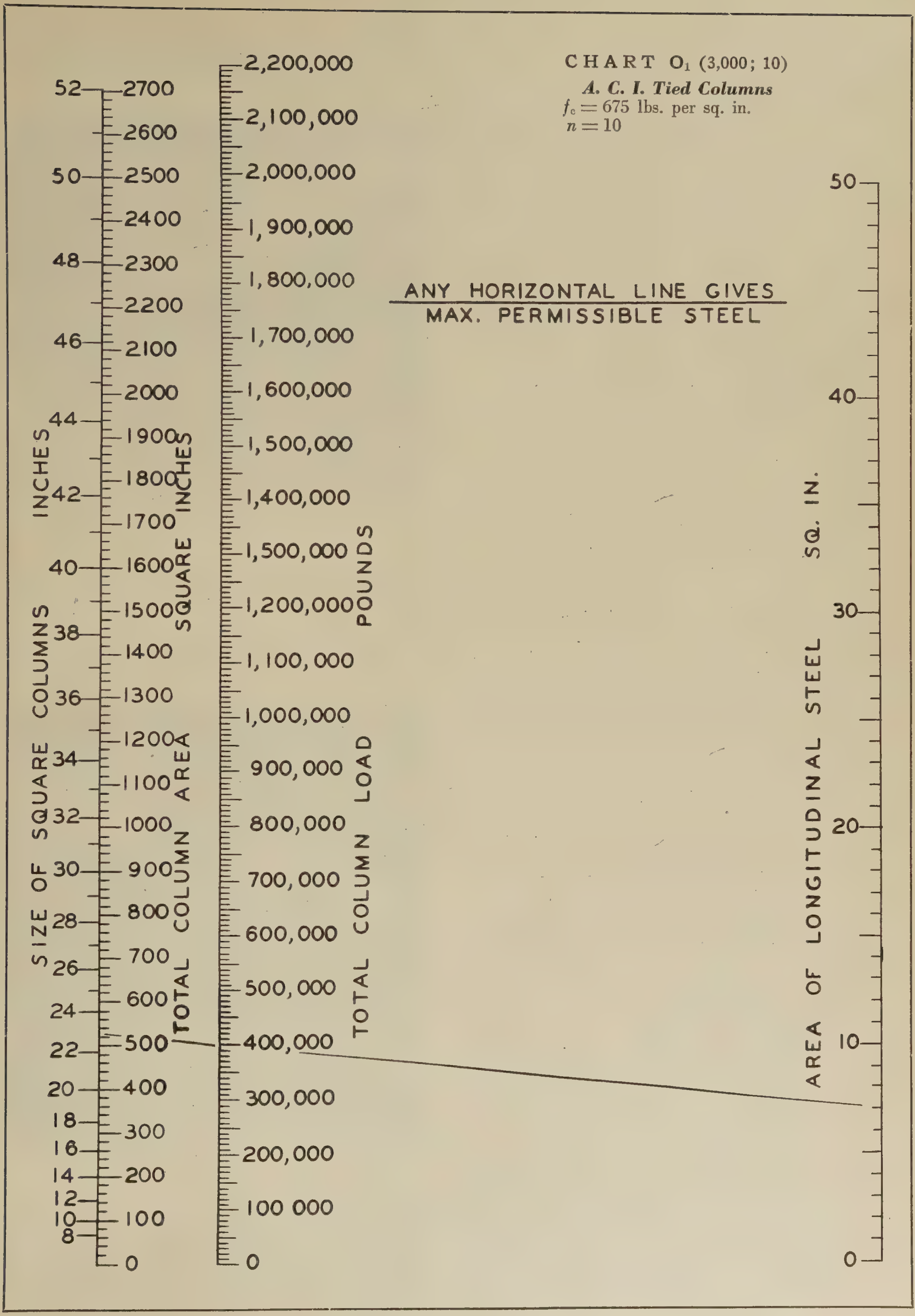


CHART O_1 (3,000; 10)

A. C. I. Tied Columns

$f_c = 675$ lbs. per sq. in.

$n = 10$

ANY HORIZONTAL LINE GIVES MAX. PERMISSIBLE STEEL

$f'_c = 2{,}000$ lbs. per sq. in.
27-in. by 27-in. column.
Longitudinal steel $= 11.3$ sq. in.
$f'_c = 3{,}000$ lbs. per sq. in.
23-in. by 23-in. column
Longitudinal steel $= 7.0$ sq. in.

In order better to compare the results I have tabulated them in Table 1-O_1, with the original results under the Joint Committee Specifications as 100 per cent.

TABLE 1-O_1

f'_c	Specifications			
	Joint Com.		A. C. I.	
	Concrete	Steel	Concrete	Steel
2,000	100%	100%	93%	74.3%
3,000			67.5%	46%

The A. C. I. Code specifies that tied columns shall be figured by the formula

$$P = 0.225\, f'_c A_G \,[1 + (n - 1)\, p]$$

$P =$ total axial column load in pounds.

$A_G =$ gross column area

$$p = \frac{A_s}{A_G}$$

$0.225\, f'_c = f_c$, working stress

Substituting the value of f_c and multiplying A_G into the bracket I have

$$P = f_c\,(A_G + pA_G n - pA_G)$$

but $pA_G = A_s$
and $A_G - A_s = A'_c$, net column area
so $P = f_c\,(A'_c + A_s n)$

This last expression is in the same form as the Joint Committee formula.

In the construction of both charts in this issue I have used the same outside scales as for the original Chart O. Fig. 1-O_1 gives the details by which the original of Chart O_1 (2,000; 15) was constructed. It will be noticed I have used the intersection of two isopleths for the location of the central scale. The central scale was calibrated by geometric interpolation.

Fig. 2-O_1 gives the details by which the original of O_1 (3,000; 10) was constructed.

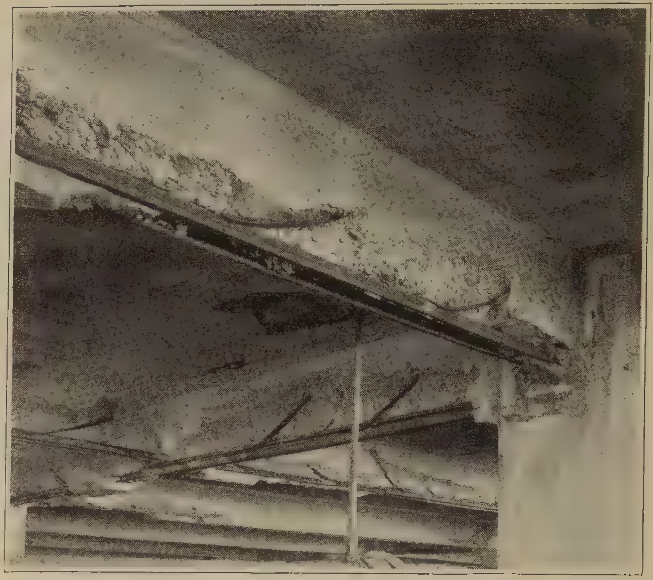
Concrete Gun Repairs Substructure of New York Municipal Baths

Overcomes Damage Caused by Salt-Laden Sea Air—Semi-Plastic Mixture of Cement, Sand and Small Coarse Aggregates Shot on Affected Parts—Dense Material Expected to Stop Corrosion of Steel

Moisture from salt-laden sea air which penetrated the concrete protection and reached the steel reinforcement in the reinforced concrete substructure of the New York Municipal Baths, on Coney Island, had been corroding the steel and bursting off the concrete outside the steel. This damage had been going on progressively for several years, to the extent that the necessity for repairs became urgent.

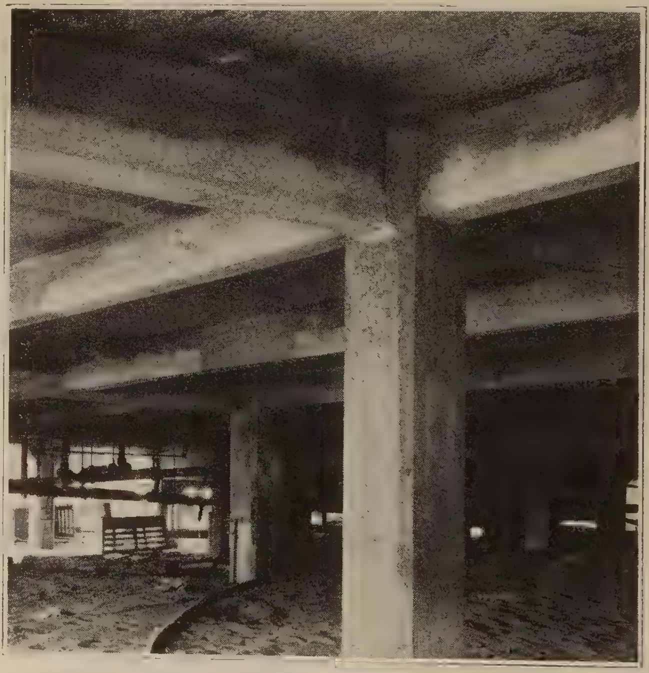
Much of the repair work was accomplished by a concrete gun of a type used for many years in relining furnaces. The concrete used was a 1:2:2 mixture of portland cement, sand and quarter-inch grit, mixed in a mortar box with sufficient water to make the concrete semi-plastic. The gun has a capacity of 2 cu. ft. of concrete, this quantity being discharged in five minutes or less. The mixture was shot through a long hose connection that operated under a compressed air pressure of 80 to 90 pounds.

Wooden corner forms were used as an aid in building out columns, girders and similar structural members to the original face. The concrete was applied in successive layers ranging from ¾ to 1 in. deep, a newly applied layer being allowed to attain a partial set before the next layer was shot. After the gun application was completed, the surfaces were troweled with a 1:2 mixture of cement and sand.



Typical appearance of reinforced concrete girders after damaged concrete was removed, in preparation for repair work

One illustration shows the condition of several girders after all damaged concrete had been knocked off, in preparation for the repair work. Another picture shows the repair work completed.



Girders and columns after being repaired with concrete gun

The contractors on this work were the Alliance Sand Blasting Co. of New York, and the concrete gun equipment was made by the Quigley Furnace Specialties Co., of the same city.

The Most Favorable Place for the Small Products Plant

Diversified Markets in Smaller Centers Are Logical Field —Hold Upper Hand in Local Market—Specialties Required in Every Community—Good Reputation Best Business Builder

The Second of Several Short Talks With the Products Manufacturer

THE proprietor of a small concrete products plant has asked us whether, in view of the first of these talks, it is our opinion that the Concrete Masonry Association intends to drive the small plant out of business.

Most definitely, the answer is "no." We have no inside information as to what the officers of the association intend to do; but when one considers the two men who are running this new organization, one may feel completely reassured.

For instance, there is "Spec" Collins, the president, at 87 Twenty-Seventh St., Milwaukee, and Jack Franklin, the secretary-treasurer, at 7071 Plankinton Building, in the same city. These men would have everything to lose and nothing to gain in trying to drive a small plant out of business merely because it is small. It is quite within reason to think they are interested in the small plant, interested in seeing it turn out a good product, in seeing it grow, in seeing it sell its output at a profit, and in seeing it located where its chances for survival will be the greatest.

This brings us at once to the all-important question of the logical place for the small products plant. Unquestionably the owner of a small plant who starts business in or near a large city is deliberately selecting the location that will be most difficult for him. Economically he is at a disadvantage there, for he will be in competition with plants that are on a big production basis, both in his own industry and in rival groups making other masonry materials.

The logical field for the small concrete products plant is the local market in a town or city of small or medium size. There the plant will have a distinct advantage over other masonry materials unless such materials are made in the same community.

In a small city or town a reputation of the kind that brings business is easier to acquire than it is in a big city. If it is true that in a small community "every one knows every one else," it is equally true that this fact is an advantage to the honest and reliable concrete products manufacturer.

Several representatives of CONCRETE recently visited a concrete products plant that illustrates in a striking manner the strength of the small plant in the small community. It is located in the midst of what appears, on first impression, to be a very small market. The nearest place of any consequence is a little city of about 10,000 population some 14 miles away. A road sign gives the population of the town as 325.

One does not ordinarily look for a prosperous concrete products plant in a town of 325 people; but here was a storage yard filled with products, trucks were hauling them away, and seven men were at work in the plant.

This plant has been in business for 16 years. The secret of its success lies in the fact that the products are diversified, they are the kind that fit the market in this rich farming community.

Hollow concrete building units form about the least of the output. Farmers use small quantities for foundation walls, and about a dozen buildings in the little town have concrete block walls.

The heaviest production is in concrete drain tile for farm lands, for this is a level country that requires draining, and many farms are not completely drained. Tile sizes range from 5 to 14 in. in diameter.

The second largest output is in concrete burial vaults. In the month of April they sold 35 vaults, and they average about 30 to the month. These vaults are marketed through the undertakers, retailing at $60. The undertaker gets $25 commission, which seems too high, but is necessary because that is what manufacturers of steel burial vaults have been paying.

Well casing units are a popular specialty and the selling price does not need to be trimmed to the last cent. These are made 10 at a time in a tin-lined mold devised by the plant foreman. They are popular with farmers, for they can be laid up without mortar, forming a casing 42 in. in diameter.

Chimney block and porch lattice units constitute two more specialties for which there is sufficient demand to justify their manufacture.

Culls of all the products are piled off to one side and are sold as culls, at half the regular price.

The proprietor of this plant is one of the most respected citizens of the entire community. Customers do not question the quality of the product, because from previous experience, or from the experience of their neighbors, they expect the quality to be satisfactory.

It matters little whether a community is made up of a village and surrounding farm lands, or whether it is an industrial town or city of small or medium size. The fact remains that each community is a potential market for a number of concrete specialties as well as for the ordinary building units. The opportunity for the proprietor of the small plant lies in his ability to estimate that potential demand and to develop a diversified market.

INFORMATION *and* CONSULTATION

THE HOW-TO-DO-IT DEPARTMENT

These columns are devoted to helping readers solve their problems in all phases of concrete work. Inquiries are invited. Where readers can add to or improve upon the suggestions printed, in answer to inquiries from others, they are also welcome to submit their views for possible publication.

Broken-Up Concrete as Coarse Aggregate

My problem is the use of broken concrete, crushed and screened, as aggregate in new concrete. Can a fairly strong concrete be made from such aggregate, so that it may be used in a location such as the base course of a concrete floor over which no heavy traffic passes?—O. P. S., Niagara Falls, N. Y.

The practice of using broken-up concrete, crushed and screened, as coarse aggregate in new concrete is permissible only where no great strength is required, and where watertightness is not necessary. As you suggest, it can be used in the base course of a floor which will be subjected to light traffic only.

It might be used in foundation walls of a small building that has no basement; but we would not recommend its use in the foundation walls of a building with a basement, because of the greater difficulty in getting the concrete watertight.

The broken concrete should be used as coarse aggregate only, sand or other suitable material being used as fine aggregate.

The strength of such concrete can not be expected to equal the strength of concrete made in the ordinary way; but with proper care it can be made sufficiently strong for some minor purposes.

Building Units Manufacture

About three years ago a booklet was published under the title "Properties and Manufacture of Concrete Building Units." Where can I secure a copy now?—F. I. C., Chicago, Ill.

The publication you undoubtedly refer to is Circular 304 of the Bureau of Standards, published in 1926. The price is 20 cents and copies may be secured from the Superintendent of Documents, Government Printing Office, Washington, D. C.

Coloring Concrete Floors by Staining Process

I expect to put in a colored concrete floor in a residence here, to be stained a dark red, oiled and filled, then wax polished. What can I use for stain and filler, and what is the procedure to be followed?—D. McK., Oakland, Calif.

A number of companies make stains and paints for coloring concrete floors and other concrete work. A list of such manufacturers will be sent. In all cases the manufacturer's specifications will describe the procedure.

In general, the staining of a concrete floor should be preceded by the application of a dilute solution of zinc sulphate (4 lbs. of crystallized zinc sulphate to one gallon of water), in order to neutralize any free lime in the surface coat of concrete. Free lime on or near the surface is likely to saponify the linseed oil in stains or paints that are later applied. Some of the coloring pigment to be used in the final staining should be added to the zinc sulphate solution.

Allow 48 hours to elapse after applying the zinc sulphate solution, before applying any other material.

Next, apply the primer, or filler. A primer coat of boiled linseed oil will answer the purpose. Some of the coloring pigment should again be added to the boiled linseed oil. If the concrete is very hard and dense it may be necessary to add turpentine to the linseed oil, so as to increase its ability to penetrate the concrete.

After the primer coat, or filler, has dried apply the colored stain or paint coat.

For floors, stains are more commonly used. High-grade commercial stains are likely to give the best results, for most of them have undergone development and improvement throughout many years. Satisfactory results have also been obtained from a mixture of boiled linseed oil and Chinawood oil, thinned with turpentine or naphtha, and colored with the pigments necessary to produce the color or tint desired. Several applications of the stain may be necessary, depending on whether a tint or a deeper color is desired.

After the stain is thoroughly dried, the wax coat is applied in the usual way.

Standard Sizes for Concrete Building Units

Where can I get a list of the standard sizes for concrete block and tile as recommended by the Department of Commerce?—R. L. F., Columbus, Ohio.

The information you want is printed in Simplified Practice Recommendation No. 32, under the title of Concrete Building Units (Block, Tile and Brick). Copies may be obtained at 5 cents each from the Superintendent of Documents, Government Printing Office, Washington, D. C.

A. C. I. Building Regulations

Are the American Concrete Institute Building Regulations for Reinforced Concrete available in a form separate from the bound Proceedings of the Institute? If so, where and at what price may copies be obtained?—L. K., Memphis, Tenn.

The American Concrete Institute, 2970 West Grand Boulevard, Detroit, Michigan, has a limited number of copies available in separate pamphlet form, which may be obtained at 25 cents each.

Concrete for the Builder

A Department Devoted to the Promotion and
Practical Construction Details of Concrete Work

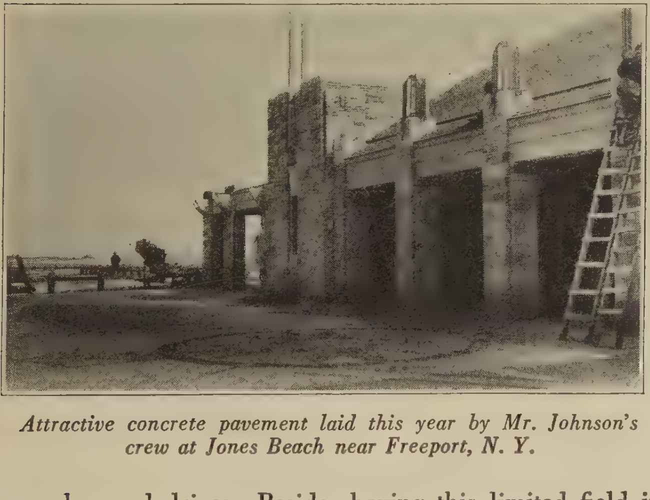
High Quality of Concrete Work Builds Profitable Business

Record of Dependable Work Brings Business to Long Island Contractor—A. S. Johnson's Reputation Is His Best Salesman

A. S. JOHNSON, a concrete contractor of Freeport, New York, has developed a profitable business because of the care he has taken during many years of active work in building up a reputation for doing a high quality of work. He started in the contracting business 35 years ago in the belief that the future growth of his business depended on the growth of its reputation; and every one of his jobs has resulted in the type of work that brings more business. He can safely show a prospective customer anything he has ever built.

Value of Reputation

Freeport, New York, Johnson's home town, is located near the southern coast of Long Island, where the people have built or are building moderately-priced homes. The work available there includes sidewalks, concrete approaches and drives. Besides having this limited field in which to work, responsible contractors operating in this section of Long Island also have to meet a great deal of irresponsible competition. Nevertheless, A. S. Johnson's reputation is known throughout the territory in which he operates, to the extent that when his name is mentioned he is spoken of as a builder from whom first class work may be expected. His record for dependability and integrity has been his best advertisement.



Attractive concrete pavement laid this year by Mr. Johnson's crew at Jones Beach near Freeport, N. Y.

Johnson has put his business in a class by itself so that a great deal of the desirable work comes to him almost at his own price. He uses salesmanship to get new business, and is active in selling to business men and to home owners. As a result, when really desirable work is available—jobs on which only first class work will be acceptable—A. S. Johnson is in line to get the contract. The question of price receives only secondary consideration.

The section of concrete sidewalk shown at the left of this bank building was built by A. S. Johnson 25 years ago

Thirty-five years ago, when Johnson first started business, he built a 4-in. concrete pavement as an approach to a material dealer's yard. This driveway has had to withstand rough traffic from all sizes and types of material trucks. Today this driveway shows no indication of wear or failure. Such work in the beginning of his career developed the reputation which he now enjoys. His name is identified with much of the good concrete construction work in the city.

Secures Sub-Contracts

When the city started construction of the bath houses at Jones Beach, a project costing several millions of dollars, Johnson was awarded a large portion of the job, more than ordinarily would have been his share. The general contractor who had the contract for the construction of Sunrise highway, an extensive seaside driveway, sub-let the construction of the sea walls and sidewalks to Johnson. There could have been no other choice. The general contractor knew that Johnson could be depended on to produce a creditable job.

Recently, when the First National Safe Deposit Company of Freeport built its new six-story bank building, it was Johnson who was awarded the contract for the construction of sidewalks and incidental concrete work. According to officials of the bank, he received this contract on the strength of his record for workmanship of high quality.

Many such instances could be cited to show Johnson's standing in his community, including a concrete walk laid by him 25 years ago. This walk was in a perfect condition when the new building was built, as a result of which the architect refused to permit it to be torn up. Despite the 25 years' of hard usage and the unusually heavy wear due to new construction work, this walk continues to serve as an advertisement for its builder.

Profitable Hook-Ups for Concrete Contractors

That there is a close relationship between concrete work and certain other lines of business is being discovered by most progressive contractors. Oil burners and concrete, or billiard tables and concrete may sound like odd combinations, but apparently the combined efforts of salesmen in these fields get new business for the concrete builder.

A progressive contractor in Ohio says, "I find that I am able to develop quite a neat amount of business by exchanging leads with a local firm selling oil burners. The home owners who are installing these burners usually are making many changes to improve the conditions in and about the house. When I get a tip on a buyer of an oil burner I immediately follow it up and get all the information I can about conditions in the house. Then, as soon as the burner has been sold and before it is installed, I call on the prospect and suggest other improvements.

"A new concrete floor or some new basement partitions may be needed. Likewise, I often suggest modernizing a room or two for a laundry and a children's playroom. This usually brings results and I get started at work which can be added to as my job progresses."

This contractor urges that the right time to go ahead with any needed improvements is when the oil burner is to be installed. In this way, all the work is done at one time and the housekeeper has the least possible amount of inconvenience. And then, too, getting all the work done at one time always costs less than doing a little each year.

"While you are doing this why don't you have your whole foundation modernized?" is another point added by the contractor. "The walls may be shored up as needed, new windows cut to let additional light into the cellar, and any leaky walls may be waterproofed." It is evident that such a system of leads and tips as this is bound to develop work for the contractor.

Another contractor has a close tie-up with a portable garage firm. Although this type of garage usually is installed where low first cost is an aim, the contractor advises that such leads are invariably a source of business for concrete drives. His chief sales points are that the driveway will last indefinitely and that it can be used when a more permanent structure is built.

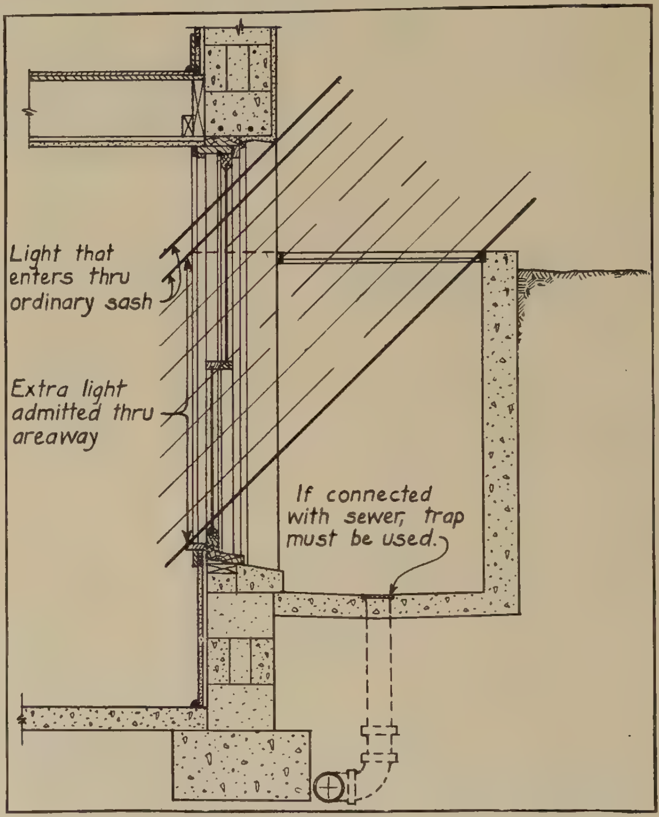
The methods of developing sales, as just described, will help extend any contracting business. "Selling," the progressive contractors say, "is the thing that changes the concrete contracting business from a mere means of livelihood to a profitable business."

Every new piece of equipment on the market for the home creates a new demand for concrete construction just as in the case of the oil burner. There are innumerable such hook-ups which a concrete builder can make to good advantage. Laundry equipment dealers, automobile dealers, billiard table dealers and many firms selling industrial equipment are worthwhile people to contact regularly.

Concrete Areaways, Admitting More Light to Basements, Provide Work for Builders

The present-day demand for adequately lighted basements, providing rooms for recreational and other purposes, opens up a new market for the concrete builder. In many homes which are being modernized, the basement space is being utilized for dens, music rooms, play rooms, billiard rooms and similar purposes.

Additional daylight will enter the basement if areaways, such as that shown in an accompanying sketch, are built of concrete. Such areaways are simple to build and should be easy to sell. The home owner who has installed an oil burner or a gas device for heating his home usually is anxious to use the basement space that is made available after the coal bins are removed or rendered useless. The concrete builder will find such a home owner one of the best prospects for concrete areaways. Store owners and others who have poorly lighted basements will also be interested in this method of getting more light into dingy, dark basements.


Light that enters thru ordinary sash
Extra light admitted thru areaway
If connected with sewer, trap must be used.

The accompanying sketch can be used by the builder when he is selling areaway construction; it shows, better than words can express, how much more light is admitted through an areaway than through the ordinary sash.

Thickness of Concrete Walks

The thickness of concrete walks may vary from four to six inches. If used only as a walk, four inches is generally thick enough; but if heavy vehicles are likely to be driven over the concrete, six inches should be the minimum thickness.

Specifications for Concrete Tennis Courts

Preparation of the Sub-Base, Laying, Finishing and Curing of Tennis Courts—High Quality of Work Insured by Adherence to Specifications

CONTRACTORS generally are finding a profitable business in concrete tennis court construction. In fact, many who are located in sections where tennis is especially popular have made tennis court construction their specialty.

It is often found to be helpful to a contractor when selling his services, to present specifications to cover the work he proposes to do. This has the effect of satisfying the customer as to the quality of workmanship he is to receive.

In view of this, concrete contractors will be interested in the following typical specifications for reinforced concrete tennis courts, which have been adopted by the Glen Ellyn Park District, Glen Ellyn, Illinois.

(Beginning of Specifications)

These specifications provide for the construction of one or more concrete tennis courts, according to the plans shown on the attached drawings. The specifications cover the preparation of the sub-base and the laying, finishing, and curing of the courts. The grading will be done by the Board of Park Commissioners.

Sub-Base Preparation and Materials

1. *Material.*

(a) The material used for subgrade shall be clean cinders, thoroughly compacted.

2. *Depth.*

(a) The depth of the subgrade shall be not less than six (6) inches.

3. *Drain Tile.*

(a) Drain tile shall be placed according to plans.

Materials

4. *Portland Cement.*

(a) Portland cement shall conform to the "Standard Specifications and Tests for Portland Cement" (Serial Designation C9-26) of the American Society for Testing Materials.

5. *Concrete Aggregates.*

(a) Concrete aggregates shall consist of natural sands and gravels, crushed rock, or other inert materials having clean, uncoated grains of strong and durable minerals.

(b) Size. Coarse aggregate for the base course shall not exceed 1 inch in diameter.

Fine aggregate containing more than ten (10) per cent of material passing a 50-mesh sieve shall not be used. Fine aggregate shall not contain vegetable or other harmful matter, nor more than three (3) per cent of clay or less.

6. *Water.*

(a) The water used in mixing concrete shall be clean, and free from strong acids, alkalis, oil, or organic materials.

7. *Metal Reinforcement.*

(a) The reinforcement shall be welded, square mesh, cold-drawn steel wire fabric, and the effective weight per 100 square feet shall be not less than 50 pounds.

8. *Joint Filler.*

(a) The joint filler shall be prepared felt, one-half (½) inch in thickness and five (5) inches in width.

Sub-Grade

9. *Grade Line.*

(a) The grade line for the finished surface of the court shall be established three (3) inches above the ground level at the net line.

10. *Preparation.*

(a) The subgrade shall be stripped of loam, roots, sticks or other matter which will rot or decay.

11. *Depth.*

(a) Should the subgrade be clay, it shall be excavated to a distance eleven (11) inches below the finished surface of the court. If the subgrade is sand or gravel or other material which will drain readily, it shall be excavated five (5) inches below the finished surface of the court.

12. *Fills.*

(a) All fills within eleven (11) inches of the finished surface of the court shall be made of steam boiler cinders. All fills below the eleven (11) inch level shall be made of clay, gravel or cinders.

13. *Compacting of Subgrade and Fills*

(a) The subgrade shall be uniformly compacted before a fill is started. The fills shall be made in layers not to exceed six (6) inches in thickness and each layer shall be uniformly compacted before the next is started.

14. *Wetting.*

(a) Water shall be used wherever it will be of help in compacting the fills.

15. *Drainage.*

(a) Tile drains provided with an unobstructed outlet shall be installed as shown on the attached plans. The ditches in which drains are laid shall be back-filled with pebbles or crushed stone not smaller than one-half (½) inch.

Forms and Details of Construction

16. *Design.*

(a) The construction of the courts shall conform to the shape, lines and dimensions as called for on the plans. Where the specifications and the plans conflict, the specifications shall be taken as the authority.

(b) Slope. Double courts. Each court shall be given a slope of four (4) inches from the longitudinal expansion joint between the two courts, to the outside of each court.

Single court. The single court shall be given a slope of four (4) inches from one side to the other.

17. *Dimensions.*

(a) Thickness. The total thickness of the finished slab shall be not less than five (5) inches.

(b) Length. The length shall be not less than one hundred and eighteen (118) feet.

(c) Width.

Double court. The total width shall be not less than one hundred and two (102) feet.

Single court. The width shall be not less than fifty-six (56) feet. (Length 118 feet.)

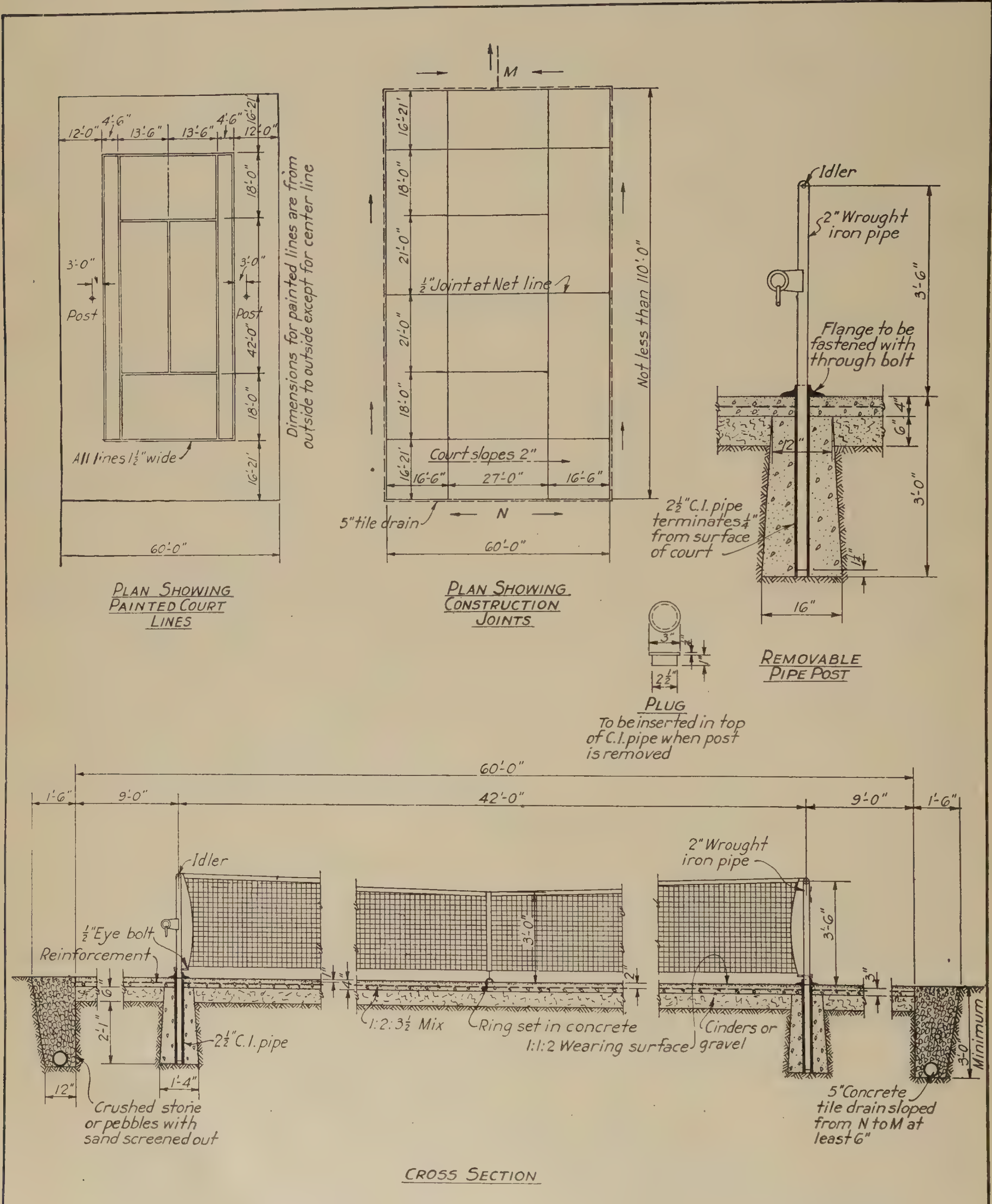
18. *Placing Reinforcement.*

(a) Metal reinforcement shall be accurately placed within the slab, two (2) inches from the surface of the court.

19. *Construction Joints.*

(a) Expansion joints shall be provided at the net line, and on double courts shall also be provided at the longitudinal center line between them.

(b) Expansion joints shall be one-half (½) inch wide and extend the full depth of the slab. They shall be



PLANS AND CROSS SECTIONS OF CONCRETE TENNIS COURT filled with prepared felt. All expansion joint fillers shall be trimmed level with the surface of the courts before acceptance.

20. *Surface Drainage.*

(a) The surrounding ground shall be shaped up to the court so that surface water will not drain upon the court.

Forms

21. *Materials.*

(a) Forms shall be free from warp and of sufficient strength to resist springing out of shape. Wooden forms shall be of not less than two (2) inch stock.

22. *Setting.*

(a) The forms shall be well staked or otherwise held to the established line and grades and their upper edges shall conform to the established grade of the court.

23. *Treatment.*

(a) All wood forms shall be thoroughly wetted and metal forms oiled before depositing any material against them. All mortar and dirt shall be removed from forms that have been previously used.

Concrete Quality and Proportioning

24. *Concrete Quality.*

(a) The working stresses for the design of tennis court slabs are based upon the minimum ultimate 28-day strength of the concrete to be used. The strength of concrete shall be fixed in terms of the water-cement ratio, as provided in Sec. 25.

(b) The water-cement ratio is hereby defined as the total quantity of water entering the mixture, including the surface water carried by the aggregate, expressed in terms of the quantity of the cement. The water-cement ratio shall be expressed in U. S. gallons of water per sack (94 lb. net) of cement.

25. *Water-cement Ratio.*

(a) The water-cement ratio shall not exceed six (6) U. S. gallons of water per sack of cement.

Surface water contained in the aggregate must be included as part of the mixing water in computing the water-cement ratio.

26. *Mixing.*

(a) The concrete shall be mixed until there is a uniform distribution of the materials and the mass is uniform in color and homogeneous. The mixer shall be of such type as to insure the maintaining of the correct proportions of the ingredients. The mixing shall continue for at least one minute after all the ingredients are in the mixer.

27. *Placing.*

(a) When concreting is once started, it shall be carried on as a continuous operation until the placing of the section is completed.

28. *Finishing.*

(a) After the wearing course has been brought to the established grade by means of a strikeboard, it shall be worked with a wood float in a manner which will thoroughly compact it and produce a surface free from depressions or inequalities of any kind. The surface shall be steel troweled, but excessive working shall be avoided.

(b) After the wearing surface has been troweled and before the concrete has thoroughly hardened, the surface shall be lightly brushed in one direction with a fine hair broom.

Protection

29. *Protection from Weather.*

(a) The concrete surface must not be damaged or pitted by rain drops and therefore the contractor shall provide and use, when necessary, sufficient tarpaulins to cover completely all sections that have been placed within the preceding twelve (12) hours.

30. *Curing.*

(a) As soon as each finished court section has hardened sufficiently to prevent damage thereby, the surface shall be covered with at least one (1) inch of wet sand, which shall be kept wet by sprinkling with water twice daily for at least seven (7) days, or by ponding with water for at least seven (7) days.

Miscellaneous

31. *Court Lines.*

(a) The necessary court lines shall be one and one-half (1½) inches in width and shall be marked as indicated. All lines shall be formed by painting with two coats of concrete paint.

32. *Grading Around Court.*

(a) The ground around the court for a distance of three (3) feet from the court limits shall be graded up level with the court surface, using clay or earth firmly compacted.

33. *Color.*

(a) If it is deemed desirable to incorporate color in the concrete placed above the reinforcing, this coloring material shall be placed in the mixer with the other materials in the quantities specified.

(b) This coloring matter will be furnished by the owner.

34. *Time Limitation.*

This work must be completed within thirty (30) days after the contract is awarded.

(End of Specifications)

A contractor who submits thorough-going specifications of this character, or who induces the owner of the proposed tennis courts to adopt them, will protect himself against the competition of irresponsible bidders who might otherwise bid low with the expectation of skinning the job. As in all kinds of construction work, complete specifications are a protection to the contractor who places a value on his reputation for good workmanship.

Business in Barnyard Pavements

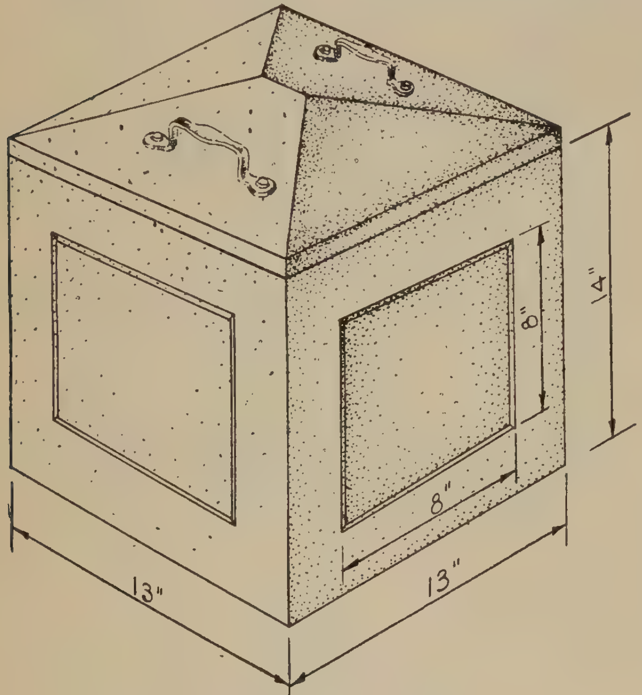
Paved barnyards are not a luxury for the progressive farmer. The progressive concrete contractor, working in rural communities, can convince farmers that a concrete-paved yard, from the standpoint of manure saved, will pay off the cost of construction in a few years. It will keep the stock out of the mud and filth, and make it easier to keep the animals clean and in good health. Concrete yards may be built in sections 10 ft. square at a time, if the farmer can not afford to have the entire job done at once.

Protecting Concrete in Hot Weather

With the coming of hot and dry weather, the problem of keeping fresh concrete from drying out too rapidly becomes one of the most important points in concrete construction. A simple method of providing protection is to cover the concrete with a layer of straw. Keep the straw moist by sprinkling twice daily for about a week or 10 days.

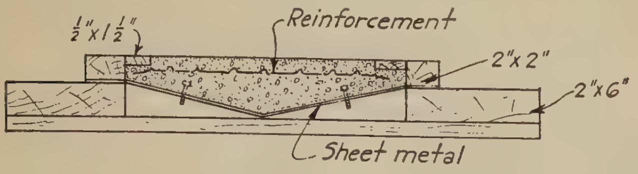
Making Concrete Box for Crematory Ashes

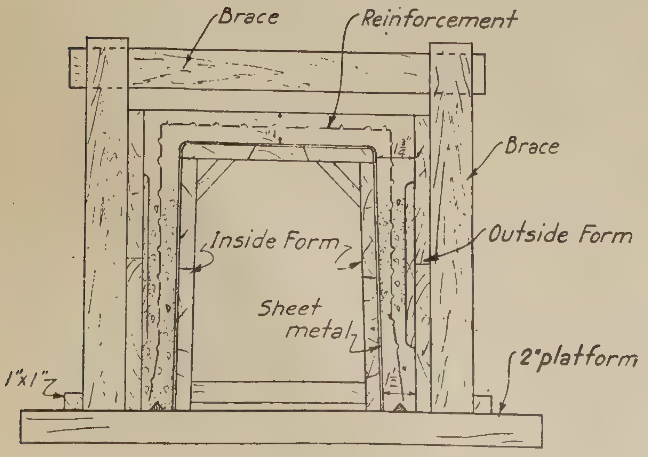
A concrete box of a design similar to that shown in an accompanying sketch is being used at the Graceland Cemetery, Chicago, Illinois, for the purpose of holding ashes of cremated bodies. Some information on the forms required to build this box and the specifications for its construction are given below.



Inside, the finished box measures 10 in. square by 12 in. high when the cover is set in place. The walls average 1½ in. in thickness and are reinforced. The cover, which is built of reinforced concrete, is made to fit down into the box about ½ in. to facilitate obtaining of a tight joint.

The outside mold should be made of soft pine, cypress or fir. It should be thoroughly shellacked before use. The inner core or form, as shown in an accompanying drawing, can be made of a wood frame covered with thin sheet metal. Both the outer form and the core should be oiled with paraffin or machine oil of light color before use and thoroughly cleaned after use.





The simple form required to cast the reinforced concrete cover is also shown in an accompanying drawing.

Bronze, copper or brass bolts should be inserted in the cover form before concrete is placed. When the cover is cured handles of same material are attached with nuts to match the bolts. The handles are not always necessary, but they will aid in placing the lid and, likewise, in selling the boxes.

Any large mesh expanded metal or welded wire fabric reinforcing will be satisfactory for both the walls of the box and the cover.

Concrete should be made in the proportions of 1 part portland cement to 2 parts of torpedo sand in which not more than five per cent is retained on a ¼-in. screen and not more than five per cent nor less than two per cent passes a 100-mesh screen, well graded in between. Concrete should be mixed to a very stiff plastic consistency that can be easily rodded into the forms. A slight vibration of the outer form with a rubber or wooden mallet will aid in compacting the concrete. The boxes and covers should be cured in a damp room or covered with wet burlap for at least one week.

After the boxes and covers are removed from the curing room they should be painted with one or two coats of light colored cement paint.

It will be well to slightly roughen, with a coarse fiber brush or other implement, the edge of the lid that will come in contact with the mortar and form the watertight key when the lid is set. Sufficient mortar, composed of 1 part of portland cement to 1½ parts of mortar sand, mixed to plastering consistency, is placed in the V-shaped groove so that when the lid is put in place, the groove will be filled and enough mortar forced out to completely cover the top edge of the box. This will form a full mortar joint for the cover.

Why Concrete Floors Were Used

Ralph E. Stoetzel, a Chicago architect, specified reinforced concrete floors throughout for an imposing Glencoe, Ill., home because they provided the best possible base for the special floor finishes he and his client desired. In general, home specialists are becoming increasingly aware of the desirability of stable, firesafe floors, whether the finish is to be integral or applied.

Home owners, prospective builders and architects are all interested in getting their money's worth. First cost is not the standard of merit, providing it is not excessive. Concrete can be installed at a reasonable figure to begin with; as time goes on its relative expense becomes lower and lower.

Building Out Termites

Extermination of termites is practically impossible, once they have entered a building. The only effective method of curbing their activity is to build them out. This is most successfully accomplished with concrete foundations, keeping all woodwork at least 18 inches from the ground.

Cobblestone Construction

Cobblestone buildings have a sturdy and rustic appeal. They combine permanence with economy and ease of construction to a marked degree. Where such stone is prevalent it can be put to good use as a building material with the assistance of a little concrete mortar.

$1,800 Worth of New Driveway Business Develops from Advertising in Week

The firm of A. C. Wetzen, Inc., Buffalo, New York, is firmly convinced that advertising pays. And this company has a right to believe that "telling the public" brings good results. The accompanying advertisement, with the following article, appeared for one week in "The Buffalo Times." Mr. Wetzen advises that he can trace $1,800 worth of new business directly to this advertisement.

The news article which accompanied the advertisement was headed: "Research Perfects Concrete Driveway Construction," and the text of the article was as follows:

"A. C. Wetzen, Inc., are making a unique offer on all orders for concrete driveways received up to and including May 10th. They will install, at no additional cost, drain tile under your driveway, thus keeping the water from accumulating and preventing, to a great extent, future frost cracks. Another advantage of having such tile installed is that no water can pass through the cinders under the driveway and into your cellar with this tile drainage under the drive.

SPECIAL OFFER GOOD UNTIL MAY 10th
Drain Tile Will Be Placed Under Your

Substantial
Steel Mesh
Reinforcement

Permitting trucks to deliver coal directly to your cellar will cost approximately only $15 more for the average driveway. Ask us the advantage of this.

25% on Completion of Work
Balance Monthly

WETZEN QUALITY
CONCRETE
DRIVEWAY
AT NO ADDITIONAL COST

Preventing to a great extent future frost cracks and seepage in cellar.

ON ALL ORDERS RECEIVED BY MAY 10th

A. C. WETZEN, Inc.
CONCRETE WATERPROOFING
83 ROESCH AVE. Del. 7803

"Mr. Wetzen makes this offer because he knows that one of the big improvements planned by a great many property owners in Buffalo and vicinity this spring is having a concrete driveway laid on their lots. The reasons for having this done are many. In the first place, a concrete driveway adds greatly to the value of the property, either from a selling or a rental viewpoint. Again, if the owners themselves are living on the property and own a car, a concrete driveway will add greatly to their convenience, save wear and tear on the car going in or out from the garage and will add greatly to the appearance of the yard.

"The property owner who is contemplating such an improvement should be sure that the driveway is put down by a firm that knows concrete and particularly specializes on driveways, because the knowledge and experience that goes into the laying of the concrete and the perfection of drainage, foundations, etc., makes the difference between a permanent, satisfactory job and one that will be a perpetual source of bother and trouble and that will eventually have to be ripped up and a new drive laid.

"Therefore property owners will do well to consult A. C. Wetzen, Inc., 83 Roesch avenue, before they go ahead with this work. Mr. Wetzen, the president of this firm, has made a specialty of concrete driveways and through experimentation and research has developed the laying of concrete driveways and sidewalks to a science. He can plan and construct a driveway that will give you lasting satisfaction and be a source of pride to you for many years. His experience is invaluable to you and is at your service, yet at the same time that you are insuring the permanence of the driveway by having Mr. Wetzen build it, you are playing safe in regard to the amount that you have planned to spend, for Mr. Wetzen will work with you to give you a satisfactory driveway at a cost in keeping with your budget.

"The Wetzen payment plan makes paying for your driveway easy. The terms are 25 per cent down when the work is completed and the balance in easy monthly payments. Thus you can use the driveway while paying for it.

"In addition to a thorough knowledge of concrete, A. C. Wetzen specializes in waterproofing of cellars. He will do the job thoroughly for you at a reasonable cost, or if you prefer you may buy the material from him and put it on yourself. A competent man will be furnished to show you how.

"Call Delaware 7803 and let Mr. Wetzen furnish you with detailed information and estimates. He will be glad to put his experience and knowledge of concrete driveway and sidewalks, waterproofing of cellars, etc., at your disposal."

Concrete—An Important Aid to Outdoor Sport

Longer days, daylight saving in the cities and the general urge to be outdoors are combining to crowd every available playground. On some of them there is ample equipment; others are lacking in the facilities which help to make outdoor play so popular.

The uses of concrete for the purposes of play are varied. Swimming pools, tennis courts, handball courts, shuffleboard courts—these are some of the more obvious uses of concrete in playground equipment.

According to "The Playground Year Book," some fifteen million dollars are spent annually to equip American playgrounds. And the investment is growing steadily. Recreation has entered the bond issue field. In 1928, for example, forty-one cities reported bond issues for recreation purposes totalling $22,517,000. Shorter business hours, daylight saving and the spread of the gospel of play for efficiency's sake combine to make the equipment for play a kind of public utility.

Down in St. Petersburg, Florida, there is a set of concrete shuffleboard courts. And in the month of January alone 33,796 people used those courts—a figure which, according to the Recreation Bureau of the city, is larger than the attendance report for any other sport. Obviously the concrete used in any one set of shuffleboard courts is not great—a layout of ten courts requires only 350 yards of six-inch concrete. But multiply 350 by the number of potential installations, and the figure amounts to something. There are more than twelve thousand play areas in the country; and concrete contractors can get business in all of these areas.

A concrete tennis court requires a respectable amount of concrete. And tennis is growing in popularity year by year, with the result that the nation's 7,000 tennis courts are crowded on every fair playing day. A concrete court is usable for a far longer period than any other type of court and requires practically no maintenance.

Private individuals, country clubs, community clubs and civic organizations are being forced to pay attention to the facilities for play. Concrete is of importance to them, in terms of satisfaction and economy; important to concrete contractors, in terms of increased business.

Concrete Sidewalks

Concrete sidewalks need a firm base. If the soil is well drained, the concrete can be placed directly on it after all refuse has been removed and the ground well tamped.

The Concrete Industry
—25 YEARS AGO

THE plant of a New England shoe factory "stands today as the largest example of reinforced concrete building construction in this country and probably in the world," according to the leading article in the July, 1905, issue of CONCRETE.

"This plant," it continues, "is comprised of ten enormous buildings and has a floor space of over ten acres."

Form work is told about in detail, as are also the construction of foundations, mixing and placing, and inspection.

* * *

AGITATION for recognition of concrete block in building codes is no new thing. One of the items published 25 years ago also carried the banner, but censured current extravagant statements regarding the superiority of concrete block, and urged closer adherence to facts on the part of those interested in promoting the concrete product.

* * *

THE work of a Detroit block manufacturer in bringing about improved architecture in buildings employing his product is told and three structures are illustrated. One is a church in which broken "ashler" was used, and was "as pleasing in appearance as any natural stone. One can examine this minutely and at close range without discovering whether a majority of the blocks are natural or manufactured rock."

* * *

THE concrete dome of a Belgian railway station is reproduced in full page size in the July, 1905, issue of "Cement Age," and is accompanied by a brief description.

"As originally planned," the item states, "it was intended that the dome should be built in stone, but reinforced concrete was adopted when it was found that the foundation would not carry the load.

"The entire structure, which is 1800 tons in weight, rests entirely upon four columns at the angles of the glass lights, for it was only at these points that a sold support could be obtained.

". . . the moldings and all sculptures which are so numerous and of so many different forms, have been executed by direct moulding. M. Vasanne has invented a very ingenious system of moulding. He begins by executing in plaster the model of the sculptures which are to be reproduced. He then spreads upon this negative mold a layer 1.2 in. to 2 in. thickness of a paste made of sawdust and magnesium oxychloride. This paste hardens rapidly and gives him the desired mould which is light, strong, and can be worked like wood; the same negative mould can be used several times."

* * *

A LENGTHY article of 13 pages, by J. J. L. Bourdrer and entitled "Concrete and Concrete-Steel in Holland" deals chiefly with the important reinforced concrete work of the day. The initial construction of this character, it is stated, was begun in 1893—an underground water conduit for a sluice underneath a river embankment.

Other work such as foundations, quay walls, locks and bridges is described.

Organizations

American Concrete Institute; Harvey Whipple, Secretary, 2970 West Grand Blvd., Detroit, Michigan.

American Concrete Pipe Association; M. W. Loving, Secretary, 33 W. Grand Ave., Chicago.

American Road Builders' Association; Chas. Upham, Engineer-Director, 914 National Press Building, Washington, D. C.

American Society of Civil Engineers; Geo. T. Seabury, Secretary, 33 W. Thirty-ninth St., New York City.

American Society for Testing Materials; C. L. Warwick, Secretary-Treasurer, Engineers' Club Building, 1315 Spruce St., Philadelphia, Pa.

Associated General Contractors of America; C. S. Embrey, Secretary, 1150 Munsey Bldg., Washington, D. C.

Cast Stone Institute; L. A. Falco, Secretary, Chapel St. and Blatchley Ave., New Haven, Conn.

Building Officials Conference of America; Col. John W. Oehmann, Secretary, 1253 Lawrence St., N. E., Washington, D. C.

Cement Institute; Luther G. McConnell, General Manager, 11 East 44th St., New York City.

Concrete Masonry Association; Jack Franklin, Secretary, 7071 Plankinton Bldg., Milwaukee, Wisconsin.

Concrete Reinforcing Steel Institute; M. A. Beeman, Secretary, Tribune Tower, Chicago.

Haydite Manufacturers' Association; Dan F. Servey, Secretary-Treasurer, 203 Mutual Building, Kansas City, Mo.

Iowa Concrete Products Association; R. L. Gavin, Secretary-Treasurer, 1002 Hubbell Bldg., Des Moines, Iowa.

National Association of Paris Transit Mixed Concrete Manufacturers; Chas. P. Maloney, Secretary, E. Water and E. Salmon Streets, Portland, Oregon.

National Board of Fire Underwriters; W. E. Mallalieu, General Manager, 85 John St., New York City.

National Concrete Burial Vault Association; J. H. Stuart, Secretary-Treasurer, Bremen, Ohio.

National Crushed Stone Association; J. R. Boyd, Secretary, 751 Earle Building, Washington, D. C.

National Fire Protection Association; Franklin H. Wentworth, Secretary, 40 Central St., Boston, Mass.

National Lime Association; Norman G. Hough, Secretary and Manager, 927 Fifteenth St., N. W., Washington, D. C.

National Sand and Gravel Association; V. P. Ahearn, Executive Secretary, 432 Munsey Building, Washington, D. C.

National Slag Association; H. J. Love, Secretary-Treasurer, 937 Leader Building, Cleveland, Ohio.

Northwest Concrete Products Association; W. P. Hews, Secretary-Treasurer, Yakima, Wash.

Ohio Concrete Products Association; G. M. Friel, Secretary-Treasurer, 2284 North High St., Columbus, Ohio.

Portland Cement Association; William M. Kinney, General Manager, 33 W. Grand Ave., Chicago.

Rail Steel Bar Association; H. P. Bigler, Engineering Secretary, Builders' Building, 228 N. La Salle St., Chicago, Ill.

Wisconsin Concrete Products Association; Jack Franklin, Secretary-Treasurer, 425 East Water St., Milwaukee, Wisconsin.

New Equipment and Materials

Complete Handling and Batching Plant for Bulk Cement

The Blaw-Knox Company extends the scope of its engineering service to contractors interested in the handling and batching of bulk cement for road paving and for central mixing, enabling the contractor to secure the price benefit of buying his cement in bulk.

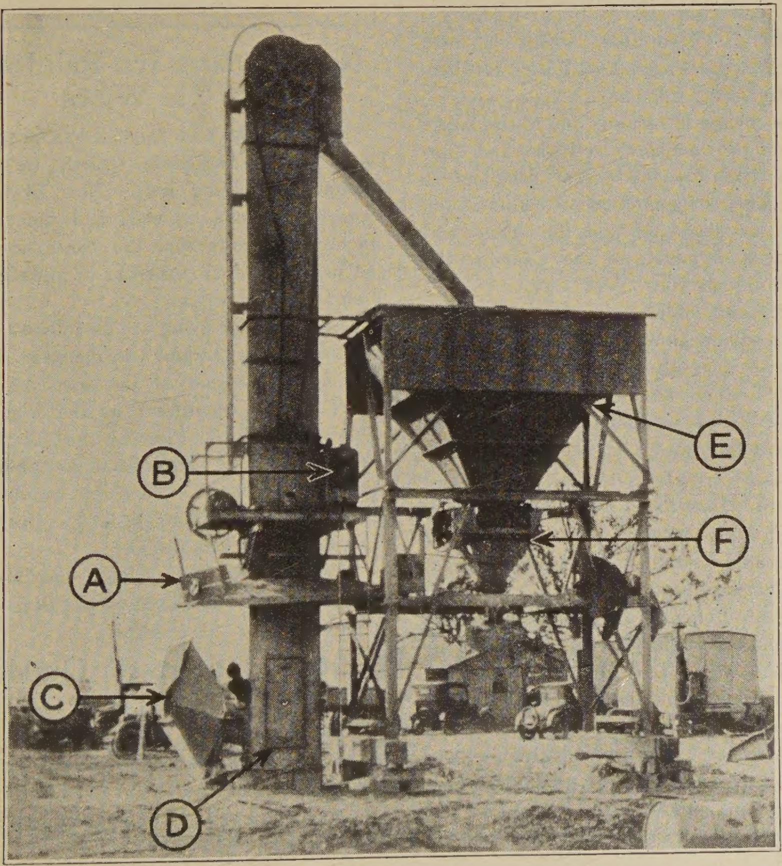
The complete plant arrangement is made up of the following units, shown in the illustration below.

Power shovel (A) driven by 15 h.p. gasoline engine (B) removes cement from railroad cars and deposits it into a folding boot extension (C) which empties into bottom of vertical elevator (D) which discharges into a 21-ton self-cleaning steel cement bin (E).

The weighing batcher (F), an integral part of the steel bin, receives cement through a series of manually operated gates, whence it is deposited into a 10-inch diameter canvas tube.

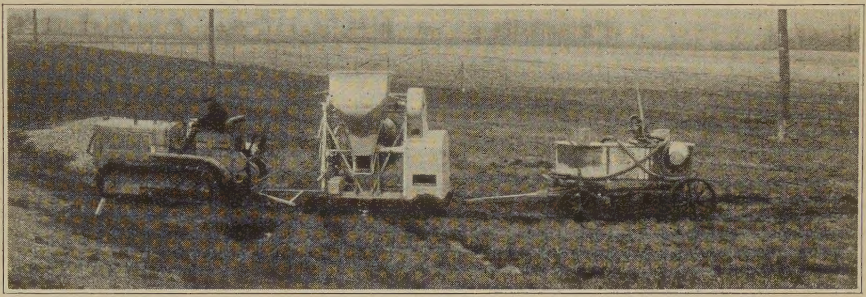
This tube terminates in a countered sheet metal bell, which spreads the cement on top of a truck-load of previously loaded aggregates.

This plant is variable as to capacity, and conveyor discharge for special cement cars can also be furnished.



Caterpillar Tractors in Power Line Construction

Two Caterpillar tractors are being used by the L. E. Myers Co., Chicago, during the erection of high tension power lines in Illinois.



One is used with a post hole digger and the other for various hauling, such as transporting the gravel, mixer and supplies and for land clearing.

Quigley Concrete Gun Enters Construction Field

The Quigley Furnace Specialties Company, 56 West 45th Street, New York, has introduced its concrete gun to the construction field through the use of the equipment in the repair of the reinforced concrete substructure of the New York Municipal Baths at Surf Avenue, Coney Island. The illustration shows the use of the gun on this work, which included repair of columns, girders, cross beams, floors and piling.

The Quigley Concrete Gun is said to have a capacity of 2 cu. ft. of mixed concrete, which is discharged in four or five minutes. It shoots a semi-plastic mixture, with coarse aggregate sizes up to ⅜ or ½ in., through a long hose connection fitted with a ¾-in. pipe nozzle, slightly curved at the tip and having an oblong aperture. There are no valves in the nozzle, the flow of material being controlled by the gun operator. On the Municipal Baths repair work, air was supplied by an Ingersoll-Rand portable compressor located more than 100 ft. away.

This gun has been used many years in the relining of furnaces and kilns.

About Makers of Equipment and Materials

Industrial Literature

Truscon Tells About Waterproofing

The Truscon Laboratories, Detroit, Michigan, are the authors of a book of 100 pages just published entitled "*Waterproof Construction.*"

It "is primarily a collaboration of the several details of waterproofing and dampproofing below-grade and above-grade construction, leaving features of design and correct building practice to textbooks already covering those points and to the experience of competent contractors."

The waterproofing of all kinds of concrete work, including mass concrete, basements, mortar, stucco, block, swimming pools, and the dampproofing of walls, stucco and masonry, are some of the subjects covered.

Material Handling Conveyor Catalog

A new catalog, *No.* 202, on "*Bulk Material Handling Conveyors*" has just been published by the *Chain Belt Company* of Milwaukee, Wis. This book gives engineering data and illustrations on Rex bucket elevators of all types, super-capacity elevators, bin gates, track hoppers and feeders, steel apron and pan conveyors, weigh larries and screw conveyors.

Correct Coloring

"*The Art of Coloring Cement*" is the title and subject of Bulletin 30, published by the *Geo. B. Smith Chemical Works, Inc.,* Springfield, Ill.

This is an 8-page booklet summarizing the latest knowledge of the practical use of color pigments in concrete, plaster, stucco and cement specialties of all kinds.

Small Job Units

The equipment on the small job is dealt with by a new broadside published by the *National Equipment Corporation,* Milwaukee, Wisconsin. Units described and illustrated include mixers, hoists, pumps, trailers, material elevator and plaster mixer.

Joist Floor Construction

A new issue of the *Concrete Reinforcing Steel Institute's* series on concrete joist construction floors covers their use in residences and small buildings.

The forming for treads and risers is also touched on.

Heltzel Catalog

The Heltzel Steel Form & Iron Co., Warren, Ohio, has just issued its new *Catalog No.* 30, devoted to the complete line of equipment.

Copies are available to engineers and contractors upon request.

Cars and Racks

Cars and racks for the concrete masonry plant are illustrated in a small folder published by the *Chase Foundry and Manufacturing Company,* Columbus, Ohio. Four cars and three racks are shown.

Motor Truck Analysis

The General Motors Truck Company, Pontiac, Michigan, has just issued *a National Motor Truck analysis,* in a publication of 44 pages.

The operations of 46,000 trucks of varied makes are given in the form of national averages, under particular industries.

Notes From the Field

Blaw-Knox Export Organization

Blaw-Knox International Corporation is the new name for the export organization of the *Blaw-Knox Company,* which was formerly known as Milliken Brothers—Blaw-Knox Corporation, which in turn succeeded the original Milliken Brothers Manufacturing Company.

This change in name is due to the larger scope of the company's activities and thoroughly identifies the export company as such. The change of name embraces no change in personnel and the offices will remain as formerly, in the Canadian-Pacific Building, New York City.

Blaw-Knox International Corporation handles all the products of the Blaw-Knox Company in South America, the West Indies and other parts of the world where the Blaw-Knox Company is not otherwise represented.

New Masonite Departments

The Masonite-Presdwood Corporation has created several new departments at the Chicago headquarters, it was announced in June. *E. L. Saberson,* who has been connected with the company since its inception, has been appointed assistant sales manager in charge of all dealers' sales. *E. B. Bushnell* has been named head of the concrete forms department, and *J. T. Card,* who has been promoting sales of Masonite products to industries, has been appointed industrial sales manager.

Independent Tool Co. Expands

The Independent Pneumatic Tool Co., Chicago, manufacturers of Thor electric and pneumatic tools and air compressors, has purchased the *Cochise Rock Drill Mfg. Co.* of Los Angeles. This purchase is part of an expansion program inaugurated a year ago.

Henry Toch Celebrates Half Century With Firm

The fiftieth anniversary of his association with *Toch Brothers,* New York City, is being celebrated by *Henry M. Toch.* After half a century of activity as the dominant figure in the organization of dampproofing compounds manufacturers, Mr. Toch is still actively its head.

Blaw-Knox Engineer

Blaw-Knox Company announces the addition to its sales staff of *John E. Chiquoine.* He has been connected successively with the American Chemical Machinery Company, of which he was chief engineer and with the Industrial Engineering division of E. I. Du Pont de Nemours & Company.

New Equipment
(Continued)

New Twister for Reinforcing Tie Wires

The M & M wire twister has been devised for twisting plain, straight tie wires around reinforcing rods. Nos. 18 to 12 gauge wire may be used and the manufacturer suggests that the contractor use as heavy wire as feasible, to reduce the number of tie wires.

Directions for using are as follows: Put one end of the straight wire between plates and bend the end of the wire into the notch. Keep the thumb on the bent end of the wire while drawing the other end around the rods. Then bend the wire into the opposite notch. Turn the handle and pull up slightly. Bend back the wire ends to release the wire twister.

The M & M Wire Clamp Co., Minneapolis, Minn., manufactures the device.

T & B Torches for Outside Service

The Consolidated Iron-Steel Mfg. Co., Cleveland, Ohio, has just placed on the market its T & B torch for outside service. Its economy and stability are outstanding, the manufacturer points out.